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# ALIEN PLANTS GROWING WITHOUT CULTIVATION IN CALIFORNIA

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# ALIEN PLANTS GROWING WITHOUT CULTIVATION IN CALIFORNIA<sup>1</sup>

W. W. ROBBINS<sup>2</sup>

## INTRODUCTION

THE ALIEN-PLANT POPULATION of a state situated like California is of interest to the plant ecologist, the plant geographer, and, above all, the agriculturist. The introduction and migration of species, the agencies causing and facilitating their movement, the behavior of the migrants in the new environment and their influence upon it, the interaction between them and the native species, and finally the effect upon agriculture—these are among the chief considerations in a study of alien plants. As Jepson (1893)<sup>3</sup> has well expressed it: "The behavior of foreigners on our soil should in all cases be carefully observed and will form a distinct contribution to the botanical history of the state." Studies of the kind indicated above, if they did nothing more than emphasize the potential harm in incipient infestations of specific weed aliens, would serve a good purpose. This paper devotes special attention to such aliens.

Although man's conquest of the state has greatly changed its vegetative covering, there are still several areas, relatively natural and unmolested, wherein one can sketch the picture of California's pre-mission plant associations. Pertinent literature on this subject will be briefly considered in the following paragraphs.

The settlement of California has been rapid. Numerous species of foreign plants have been introduced consciously—plants of garden, orchard, field, and woodland; cereals, forage and pasture plants, root crops, vines, orchard fruits, bush fruits, and vegetables; a long list of ornamental trees, shrubs, and herbs; some drug plants, and certain plants useful for their fibers. According to the Bureau of the Census there were in California, in 1934, 6,578,724 acres of harvested land; 459,505 acres of crop-failure land; 1,625,097 acres of cropland, idle or fallow; 2,967,526 acres of plowable pasture; 16,532,240 acres of woodland or other pasture; and 1,584,496 acres of all other land in farms.

<sup>1</sup> Received for publication June 20, 1939.

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<sup>3</sup> See "Literature Cited" at the end of this paper for complete data on citations, which are referred to in the text by author and date of publication. References to individuals not accompanied by date, in parentheses, pertain to personal correspondence, or to herbarium specimens.

This is a total of 29,747,588 acres of land disturbed by man for the purpose of growing introduced and useful species or utilized for grazing. This acreage does not include the forest or grazing lands publicly owned. The establishment of these alien crop plants greatly modified, and in certain areas almost completely destroyed, the original plant covering. Further, with the development of the livestock industry, there followed major changes in the vegetation of the extensive areas grazed by domestic animals.

Most of the useful agricultural crop plants introduced by man have stayed within the limits prescribed. A few, escaping, have become what we choose to call weeds—notably Johnson grass,<sup>4</sup> certain species of *Medicago*, artichoke thistle, and common hemp.

By various well-known agencies the majority of the alien plants of California have been introduced unwittingly; and many have become highly undesirable, constituting our worst weeds. There are approximately 526 species of them growing uncultivated within our borders. Of these, some 125 species have become weeds of agricultural significance. Many aliens, however, although introduced long ago, have not proved capable of establishing themselves here over any considerable extent of territory; numerous species of "weeds," so-called, have but little economic significance. Others, especially certain grasses and the erodiums, have proved valuable as forage plants. Some immigrants, however, have spread with alarming rapidity and become of primary importance as weeds, notably Johnson grass, Klamath weed, hoary cress,<sup>5</sup> puncture vine, Napa thistle, yellow star thistle, Russian knapweed, Russian thistle, mustards (*Brassica* spp.), Bermuda grass, camel thorn, and wild morning-glory.

The invasion of California by alien plants has usually been regarded as starting with the first missions. In the words of Parish (1920) :

It will be safe, then, to assume a very definite date for the beginning of that foreign invasion which since has so greatly modified the plant population of the state. For it must have been a virgin flora that greeted the eyes of Fr. Serra and his companions, when, on the 14th day of May, 1769, they reached the bay at San Diego, to begin the conquest of Alta California for Holy Church and the Spanish Crown. The few previous explorers had arrived by sea, and had made but transient landings, but the followers of Saint Francis brought with them flocks and herds, and in the careful preparations for their expedition they had been particularly charged to provide themselves with a store of seeds of useful plants. Step by step, the long chain of missions

<sup>4</sup> The index to plant names gives a complete alphabetical list of the common plant names with scientific names in parentheses, and of scientific names with common names in parenthesis. A number of species have no well-established common names.

<sup>5</sup> In the western states the name "hoary cress" is applied to several closely related species in the mustard family.



was stretched northward along the coast, until, in 1823, the last was founded, in honor of San Francisco de Solano, near the site of the present town of Sonoma. Everywhere, one of the first proceedings was the planting of gardens, and the sowing of fields; and the neophytes, as they gathered in, were taught to be farmers and herdsmen, so that each mission speedily became a hive of industry, based on its wide acres and countless herds. Eventually a considerable secular immigration came from Mexico by way of Lower California and of Sonora; the last passing through the present Arizona and the Colorado Desert; and a scanty commerce, licit and illicit, visited the ports.

Since Parish wrote these words, Hendry (1931) and Hendry and Bellue (1925, 1936) have made admirable studies of the seeds found in adobe bricks from the walls of old buildings, including missions, whose construction dates are known. The seeds in most instances are fairly well preserved and capable of positive identification. According to these studies red-stem filaree, curly dock, and prickly sow thistle had a wide distribution before the establishment of the first missions—that is, before 1769. During the Spanish or Mission Period (1769–1824), there is evidence of the introduction into Alta California of such important aliens as common foxtail, lamb's-quarters, black mustard, bur clover, Napa thistle, Italian ryegrass, annual bluegrass, wild oat, nettle-leaf goosefoot, rough pigweed, creeping buttercup, annual yellow sweet-clover, cheese-weed, wild carrot, and Chilean tarweed. These are now widespread in the state, though not all have become troublesome as weeds.

Famous early botanists, visiting California, make scant reference to alien plants. In 1831–32 David Douglas traveled extensively on the Pacific Coast, and in 1836 Thomas Nuttall journeyed along our south coast; they made extensive collections, but included no mention of aliens. During 1843–44 John C. Fremont coursed the state from one end to the other, but records only one such plant, red-stem filaree.

Howell (1937*c*) was privileged to examine a collection of California plants made by the Russian-American Company in 1840–41, chiefly in Sonoma County. Among the 346 specimens, representing 214 species and varieties, were several aliens—definite evidence that certain species had occurred even at that early date. The following are included: red-stem filaree, white-stem filaree, annual bluegrass, windmill pink, wild radish, red pimpernel, tomatillo, yellow oxalis, black nightshade, selfheal, and a *Malva* species (seedling).

The Gold Rush days undoubtedly witnessed the introduction of many weeds now infesting California. As Parish (1920) has pointed out, however, the considerable body of botanical literature available for this period is "disappointing when searched for information concerning the weed flora"; apparently "these botanists, like most collectors in new

fields, gave their attention mainly to the many unfamiliar plants whose novelty attracted them, to the neglect of the common weeds they knew so well at home."

The first extensive botanical collections in California were made by Brewer from 1861 to 1864; and during 1866 and 1867 Bolander made a thorough botanical exploration of portions of the Sierra Nevada and also of the coast ranges north of San Francisco Bay. An account of these collections appears in Brewer and Watson's *Geological Survey of California: Botany*, issued in 1876; and additions and corrections to volume I appeared in volume II, issued in 1880. Sereno Watson, botanist of the Fortieth Parallel Survey, made the necessary revision of the Polypetalae previously prepared by Brewer.

Relying upon the studies of Hendry and Bellue (1925, 1936) and upon the Russian collection of 1840-41, together with annotated lists of Brewer and Watson, we may safely conclude that the following important alien species were fairly well established in California, at least locally, by 1860.

#### IMPORTANT ALIEN SPECIES ESTABLISHED IN CALIFORNIA BY 1860<sup>a</sup>

##### *Gramineae*

Arundo Donax  
Avena fatua  
Bromus racemosus  
Bromus rigidus  
Bromus rubens  
Bromus secalinus  
Cynodon Dactylon  
Digitaria sanguinalis  
Echinochloa Crusgalli  
Festuca Myuros  
Holeus lanatus  
Hordeum murinum  
Lamarekia aurea  
Lolium multiflorum  
Lolium perenne  
Lolium temulentum  
Panicum capillare  
Poa annua  
Polypogon monspeliensis  
Setaria lutescens

##### *Urticaceae*

Urtica urens

##### *Polygonaceae*

Polygonum aviculare  
Polygonum Convolvulus  
Polygonum Persicaria  
Rumex Acetosella  
Rumex conglomeratus  
Rumex crispus  
Rumex pulcher

##### *Chenopodiaceae*

Chenopodium album  
Chenopodium ambrosioides  
Chenopodium Botrys  
Chenopodium murale

##### *Amaranthaceae*

Amaranthus blitoides  
Amaranthus graecizans  
Amaranthus retroflexus

##### *Aizoaceae*

Mollugo verticillata

##### *Portulacaceae*

Portulaca oleracea

<sup>a</sup> In this list and in those following, the genera within a family are arranged alphabetically; the families follow the usual systematic order.

|                         |                         |
|-------------------------|-------------------------|
| <i>Caryophyllaceae</i>  | <i>Primulaceae</i>      |
| Cerastium viscosum      | Anagallis arvensis      |
| Cerastium vulgatum      | <i>Convolvulaceae</i>   |
| Silene gallica          | Convolvulus arvensis    |
| Spergula arvensis       | <i>Labiatae</i>         |
| Stellaria media         | Marrubium vulgare       |
| <i>Ranunculaceae</i>    | Prunella vulgaris       |
| Ranunculus repens       | <i>Solanaceae</i>       |
| <i>Cruciferae</i>       | Physalis ixocarpa       |
| Brassica arvensis       | Solanum nigrum          |
| Brassica campestris     | <i>Scrophulariaceae</i> |
| Brassica nigra          | Verbascum Blattaria     |
| Capsella Bursa-pastoris | Verbascum Thapsus       |
| Raphanus sativus        | <i>Plantaginaceae</i>   |
| Sisymbrium officinale   | Plantago lanceolata     |
| <i>Leguminosae</i>      | Plantago major          |
| Medicago hispida        | <i>Dipsaceae</i>        |
| Medicago lupulina       | Dipsacus fullonum       |
| Melilotus alba          | <i>Compositae</i>       |
| Melilotus indica        | Anthemis Cotula         |
| Vicia sativa            | Bidens pilosa           |
| <i>Oxalidaceae</i>      | Centaurea melitensis    |
| Oxalis corniculata      | Centaurea solstitialis  |
| <i>Geraniaceae</i>      | Cirsium arvense         |
| Erodium Botrys          | Cirsium lanceolatum     |
| Erodium cicutarium      | Cotula australis        |
| Erodium moschatum       | Cotula coronopifolia    |
| <i>Malvaceae</i>        | Erigeron canadensis     |
| Malva parviflora        | Hypochoeris glabra      |
| <i>Umbelliferae</i>     | Madia sativa            |
| Apium graveolens        | Silybum Marianum        |
| Conium maculatum        | Sonchus asper           |
| Daucus Carota           | Xanthium canadense      |
| Foeniculum vulgare      | Xanthium spinosum       |
| Pastinaca sativa        |                         |
| Torilis nodosa          |                         |

During the decade 1890–1900 numerous notes and papers added to our knowledge of California's immigrant flora. Chief of these are the writings of A. Davidson, appearing in *Erythea* and *West America Scientist*, of J. B. Davy in *Erythea*, of L. H. Dewey in *Erythea*, of Alice Eastwood in *Erythea* and *Zoe*, of E. W. Hilgard (1890) in the University of California *Report of the Agricultural Experiment Station*, of W. L. Jepson in *Erythea*, of E. L. Greene in *Zoe*, and of S. B. Parish in *Zoe*. These enable us to judge the changes in our alien-plant population during the forty years between 1860 and 1900. The important species introduced during this period are given below.

## IMPORTANT ALIEN SPECIES INTRODUCED BETWEEN 1860 AND 1900

|                              |                                 |
|------------------------------|---------------------------------|
| <i>Gramineae</i>             | <i>Zygophyllaceae</i>           |
| Bromus mollis                | Tribulus terrestris             |
| Bromus tectorum              |                                 |
| Festuca elatior              | <i>Umbelliferae</i>             |
| Hordeum Gussoneanum          | Scandix Pecten-veneris          |
| Sorghum halepense            |                                 |
| <i>Cyperaceae</i>            | <i>Solanaceae</i>               |
| Cyperus rotundus             | Solanum elaeagnifolium          |
|                              | Solanum rostratum               |
| <i>Chenopodiaceae</i>        | <i>Compositae</i>               |
| Salsola Kali var. tenuifolia | Cichorium Intybus               |
| <i>Caryophyllaceae</i>       | Hypochoeris radicata            |
| Agrostemma Githago           | Lactuca scariola                |
| <i>Cruciferae</i>            | Lactuca scariola var. integrata |
| Lepidium pubescens           | Picris echioides                |
| <i>Leguminosae</i>           | Senecio vulgaris                |
| Ulex europaeus               | Sonchus arvensis                |

Parish (1890-91), in summarizing his discussion of the naturalized plants of southern California, mentions having found 26 species not listed by Brewer and Watson. He remarks:

That nearly one quarter of the naturalized flora of the region should have been added in this short time is a notable fact, but quite in harmony with the great increase of population and the wonderful industrial development. . . . Sixty-two species of the entire 78, including all the Cruciferae and all but one of the grasses, are of European origin and the same proportion holds if the commoner plants only are considered. Fourteen are natives of other parts of America, 12 of them coming from the south and two from the north, a preponderance agreeing with the derivation of the native flora. Asia and Africa supply two species each, and Australia one.

Hilgard (1890) discussed the principal weeds of California, particularly their distribution and agricultural importance. He does not mention such present-day pernicious weeds as camel thorn, Russian knapweed, purple star thistle, Russian thistle, hoary cress, puncture vine, and Klamath weed. Apparently, therefore, these aliens were less widely spread than at present, and their introduction was relatively recent.

Davidson (1893), discussing the immigrant plants of Los Angeles County, notes not less that 22 species that were not known to occur anywhere in California when the State Survey volumes were issued from 1876 to 1880.

Since 1900, a number of aliens have come into California, the principal ones being shown in the following list. It is of interest to note that a number of them have already become weeds of great agricultural importance.



## PRINCIPAL ALIEN SPECIES INTRODUCED SINCE 1900

|  |                              |
|--|------------------------------|
| <i>Gramineae</i>                         | <i>Leguminosae</i>           |
| <i>Aegilops triuncialis</i>              | <i>Alhagi camelorum</i>      |
| <i>Holcus mollis</i>                     | <i>Oxalidaceae</i>           |
| <i>Pholuris incurvus</i>                 | <i>Oxalis cernua</i>         |
| <i>Setaria viridis</i>                   | <i>Euphorbiaceae</i>         |
| <i>Fumariaceae</i>                       | <i>Euphorbia esula</i>       |
| <i>Fumaria officinalis</i>               | <i>Verbenaceae</i>           |
| <i>Cruciferae</i>                        | <i>Verbena bonariensis</i>   |
| <i>Eruca sativa</i>                      | <i>Solanaceae</i>            |
| <i>Hymenophyllum pubescens</i>           | <i>Lycium halimifolium</i>   |
| <i>Lepidium Draba</i>                    | <i>Salpichroa rhomboidea</i> |
| <i>Lepidium Draba</i> var. <i>repens</i> | <i>Compositae</i>            |
| <i>Radiola austriaca</i>                 | <i>Centaurea Cyanus</i>      |
| <i>Sisymbrium altissimum</i>             | <i>Centaurea iberica</i>     |
| <i>Sisymbrium Irio</i>                   | <i>Centaurea sicula</i>      |
| <i>Sisymbrium Sophia</i>                 | <i>Helianthus ciliaris</i>   |

Numerous studies indicate the great changes produced in the original plant covering of California by man's conquest—by grazing, burning, cultivation, and the building of roads, ditches, towns, and cities.

Davy (1902), describing the stock ranges of northwestern California, emphasizes the aliens that have replaced much of the native grassland. In Mendocino County numerous mountain valleys occur on either side of Walker Mountain, the watershed that separates the Russian River and the Eel River drainage basins. From Sherwood Valley, a typical one north of the divide, he gained an approximate idea of the early native flora. When this valley was first settled in 1853, California oatgrass was the dominant and most valued grass of the hillside and valley floor. In 1902 the prevalent grasses were upright chess and velvet grass, both naturalized from Europe. Associated with them were soft chess, silver hairgrass, Mediterranean barley, and rat's-tail fescue, all introduced species, except silver hairgrass.

The "upland ranges" of northwestern California have suffered a similar fate. In 1902 the prevailing grasses were rat's-tail fescue, Mediterranean barley, and upright chess. Other adventive and weedy species of these upland ranges were Napa thistle, silver hairgrass, smooth cat's-ear, small quaking grass, ripgut grass, buckhorn plantain, and sheep sorrel. Besides, the Mediterranean species, red-stem filaree and white-stem filaree, had come to compose a significant part of the range feed.

Davy presents evidence that the primitive forage plants of the northwestern ranges, composed chiefly of "bunch grasses," together with annual and perennial clovers, largely disappeared with overstocking; wild



oat and red-stem filaree "took possession of the country." These immigrants increased until the native species diminished in quantity to the point where animals began grazing the introduced species. These, in turn, began to disappear and to be replaced by Mediterranean barley, rat's-tail fescue, and upright chess, the three chief range grasses in 1902. Davy described, in 1902, a third immigration: white-stem filaree, ripgut grass, common foxtail, Napa thistle, smooth cat's-ear, bur clover, and other weeds were "establishing themselves along the roadsides and around ranch houses."

Bauer (1930), studying the vegetation of the Tehachapi Mountains, finds that on the floor of the San Joaquin Valley, at the base of the Tehachapis on the north, prominent grasses are red brome, ripgut grass, common foxtail, beardless wild-rye, and alkali sacaton. He recognizes five distinct types of vegetation: (1) desert; (2) woodland—blue oak and valley oak; (3) conifer forest—yellow pine, and the like; (4) grassland; and (5) chaparral. Characteristic of the grassland are red brome, Australian chess, ripgut grass, soft chess, common foxtail, wild oat, scratchgrass, and needle-and-thread.

Bauer states:

Adventive species of the Tehachapis constitute a notable part of the present flora. Seventeen per cent of all plants encountered during the course of this investigation are in this class. About two thirds of these introduced plants are natives of Europe, while the remainder are from widely scattered parts of the world. . . . Extensive areas of burned-over grassland can be found in some part of the region every year. It is reported that in aboriginal days the natives intentionally burned the rank herbaceous vegetation yearly. For many years thereafter the custom among ranchers was for the last man bringing his stock down from the mountains in the autumn to start a fire; indeed, to do this was considered a duty. The purpose was to improve grazing conditions in succeeding years, and to protect the larger forest trees by destroying the brush and debris beneath them, thus, as it was supposed, lessening the probability of very destructive fires. The effect upon the plant communities has been an important factor in bringing a good part of the vegetation to its present condition. The large number of introduced species, 17 per cent of all encountered, presumably was greatly aided in their invasion by the repeated burnings.

Piemeisel (1932) briefly discusses weedy abandoned lands of the Mojave Desert. According to him, the dominant vegetation is the creosote bush and desert saltbush. Here, recently abandoned farm lands or neglected fallow lands are infested with Russian thistle. Land denuded of brush, where there has been no plowing, is grown up principally to red-stem filaree, red brome and species of *Amsinckia*, *Plantago*, *Thelypodium*, *Sophia*, and *Lepidium*. In discussing the southern San Joaquin Valley he points to the abandoned lands with a high water table and high salt content as being covered with saltgrass, *Dondia*, and annual

species of *Atriplex*. The west side of the San Joaquin, once a desert sage type of vegetation and now greatly denuded, is covered with filarees and red brome, associated with "pepper grass, lupines, borages, and several annual composites." Because of overgrazing and erosion, the original plant covering has little opportunity to return. In the southern San Joaquin Valley, Russian thistle particularly abounds on lands formerly occupied by bunch grass—that is, above the desert sage plains—and on recently abandoned lands in the irrigated districts.

Piemeisel and Lawson (1937), in their study of the San Joaquin Valley, include the following plant formations and their associations or units of original vegetation:

1. Broad sclerophyll formation: Tree savanna, *Quercus agrifolia*—*Q. lobata* association.
2. Grassland formation: Pacific grassland, *Stipa-Poa* association.
3. Southern desert shrub or creosote bush formation: Desert saltbush, *Atriplex polycarpa* association.
4. Salt desert shrub formation: Spinescale, *Atriplex spinifera* association; pickleweed, *Allenrolfea* association; seepweed, *Dondia* association; saltgrass, *Distichlis* association; alkali heath, *Frankenia* association.

The original vegetation of these various native associations has been markedly modified by man, chiefly through overgrazing and disturbance of the soil in the development of farming.

In the tree savanna, "the perennial cover among the oaks has been replaced by an annual cover of grasses and herbs," chiefly wild oat, red-stem filaree, broad-leaf filaree, white-stem filaree, and common foxtail. The principal species invading fallow lands and neglected farm lands are fiddleneck (*Amsinckia* spp.), black mustard, common yellow mustard, wild mustard, some Russian thistle, and annual saltbushes.

The Pacific grassland was originally dominated by purple needlegrass; associated with it were the needle-and-thread, Junegrass, pine bluegrass, melic grass, squirrel-tail grass, beardless wild-rye, and species of *Danthonia*, *Bromus*, and *Festuca*. Much of the original Pacific grassland of the San Joaquin has been plowed or heavily grazed. The overgrazed areas are now occupied by such annuals as wild oat, *Hordeum* species, red brome, red-stem filaree, broad-leaf filaree, common peppergrass, erect plantain, *Hemizonia* species, vinegar weed, and Russian thistle, the most widely distributed being red brome and the *Erodium* species. Besides these annual invaders there are such perennials as California matchweed and *Isocoma veneta* var. *vernonioides*.

Now that the desert saltbush association has been modified by farming

and overgrazing, the ground cover on the overgrazed areas is chiefly red-stem filaree, common peppergrass, red brome, erect plantain, six-weeks fescue, and *Isocoma veneta* var. *vernonioides*; and on the abandoned farm lands chiefly Russian thistle, common spikeweed, horseweed, red brome, common foxtail, common peppergrass, red-stem filaree, and fiddle-neck (*Amsinckia* spp.).

The spiny saltbush association has been less disturbed than others of the valley; but after clearing and cultivation the principal invaders are common peppergrass and dwarf peppergrass, *Baeria gracilis*, *B. uliginosa*, *Isocoma veneta* var. *vernonioides*, bractscale, fog-weed, five-hook bassia, common sunflower, red brome, common foxtail, red-stem filaree, and white-stem filaree. Piemeisel and Lawson (1932) group the four associations—pickleweed, seepweed, saltgrass, and alkali heath—under the heading "lowland types." These occupy portions of the valley having a high water table, soils of the heavier type, and considerable accumulations of soluble salts. These lowland types have been cultivated or grazed and in certain instances drained and irrigated. On the grazed areas the following species dominate: jackass clover, dwarf peppergrass, common peppergrass, *Baeria gracilis*, *B. uliginosa*, and *Isocoma veneta* var. *vernonioides*. On the abandoned farm lands of these lowland types have come in, chiefly, bractscale, fog-weed, five-hook bassia, jackass clover, common spikeweed, common foxtail, dwarf peppergrass, common peppergrass, and the three *Erodium* species.

According to an analysis of the present vegetation in the San Joaquin Valley on lands whose original plant covering has been destroyed or greatly modified by grazing, much of the stand is composed of introduced species, whereas many native species have assumed the rôle of weeds. As Piemeisel and Lawson point out, when the original vegetation is destroyed by plowing and by subsequent abandonment for one to three years, summer annuals come in and dominate the land; and, when the original plant covering is destroyed by excessive and continued grazing, there will first appear a sparse stand of summer annuals with winter annuals, then a short stand of winter annuals, then unpalatable range weeds or poisonous plants with a sparse stand of winter annuals, and finally, if excessive grazing continues, a bare or nearly bare soil.

Talbot, Biswell and Hormay (1939) present valuable data concerning California's annual-plant communities. Some 25,000,000 acres of California range land is dominated by annual plants. The areas referred to include valley and foothill grasslands, the open woodlands, and chaparral. They call attention to the "great extent to which the native vegetation over vast areas in California has been replaced by plants

introduced from the Old World." As an example, in the San Joaquin Valley introduced plants, mostly annuals, constitute 63 per cent of the herbaceous vegetation in the grassland types, 66 per cent in the woodland, and 54 per cent in the chaparral. They cite the most important introduced species from the standpoint of abundance as follows: "*Erodium cicutarium* (20 per cent of total herbaceous cover) and *E. botrys* (14 per cent), *Bromus hordeaceus* (*B. mollis*) (9 per cent), *B. rubens* (9 per cent), *B. arenarius* (2 per cent), *Avena barbata* (2 per cent), *Bromus rigidus* (1 per cent), and *Medicago hispida* (1 per cent). *Hordeum murinum*, *H. gussoneanum*, *Avena fatua*, *Festuca myuros*, and other minor or rare species comprise an additional 1 per cent." They further call attention to the marked fluctuations in the composition and yield of this annual-plant cover from season to season, and the influence upon it of grazing and rodents.

Changes in the original plant covering have been equally marked in other sections where man has carried on his various operations. In all instances, the way has been left open for alien species. Every year sees the appearance of new introductions. It is our duty to detect these, to observe their behavior, and, if need be, to exterminate the incipient infestations. If the Russian thistle first observed around 1895 had been stamped out and the importation of the seed strictly prohibited, California would have arrested a weed alien which, since 1895, has cost many millions of dollars and will, in the future, cause losses of many millions more. The same might be said of numerous other weeds. At present a number of plant immigrants, recognized in other parts of the world as bad weeds and manifesting the same tendencies under our conditions, have a relatively limited distribution here: quackgrass, Medusa-head, Austrian field cress, hoary cress, leafy spurge, white horse nettle, Texas blueweed, spiny clotbur, camel thorn, artichoke thistle, and Canada thistle. With respect to several of these weeds, the State Department of Agriculture and County Agricultural Commissioners are actively attempting extermination or control.

It is interesting to note the geographical sources of the alien plants growing without cultivation in California. Approximately 360 species or 72 per cent of the total number are from Europe and Western Asia, and fully 15 per cent of these are from the Mediterranean region. Eastern Asia, South Africa, and Australia have contributed about 10 per cent; South America approximately 10 per cent; and the United States, east of California, about 8 per cent. Apparently the introduction has been largely determined by the movements of peoples. Naturally, in view of Europe's great contribution to our human population, a large



proportion of our weeds are European. Usually, aliens have reached us not directly from Europe but by way of the eastern United States. As lines of travel were established with other countries—Eastern Asia, Australia, and South America—there naturally resulted the introduction of alien species, by one agency or another, their establishment determined by their fitness to the environment. The rapid spread of several Mediterranean species is natural in view of the great similarity of climatic conditions in the two regions.

The greatest number of aliens is in the grass family (Gramineae), with 111 species; ranking second is the sunflower family (Compositae), with 96 species. Also well represented are the mustard family (Cruciferae), 43 species; pea family (Leguminosae), 28 species; pink family (Caryophyllaceae), 21 species; saltbush family (Chenopodiaceae), 17 species; potato family (Solanaceae), 15 species; buckwheat family (Polygonaceae), 17 species; mint family (Labiatae), 14 species; geranium family (Geraniaceae), 12 species; carrot family (Umbelliferae), 11 species; and figwort family (Scrophulariaceae), 13 species.

Not all aliens are undesirable. Indeed certain immigrants, especially those invading the range lands, are of recognized value for forage. The principal ones are given in the following list, and notes on their forage value are given under the discussion of individual species.

#### IMMIGRANT PLANTS HAVING FORAGE VALUE

|                              |                           |
|------------------------------|---------------------------|
| <i>Agrostis alba</i>         | <i>Lolium multiflorum</i> |
| <i>Arrhenatherum elatius</i> | <i>Lolium perenne</i>     |
| <i>Avena barbata</i>         | <i>Lolium temulentum</i>  |
| <i>Avena sativa</i>          | <i>Poa annua</i>          |
| <i>Bromus brizaeformis</i>   | <i>Poa compressa</i>      |
| <i>Bromus catharticus</i>    | <i>Poa pratensis</i>      |
| <i>Bromus inermis</i>        | <i>Medicago hispida</i>   |
| <i>Bromus mollis</i>         | <i>Erodium Botrys</i>     |
| <i>Bromus secalinus</i>      | <i>Erodium cicutarium</i> |
| <i>Bromus tectorum</i>       | <i>Erodium moschatum</i>  |
| <i>Hordeum murinum</i>       |                           |

Whereas introduced species constitute our worst California weeds, numerous natives behave as weeds in disturbed soil—especially bracken fern, horsetail, saltgrass, sandbur, chufa, wild licorice, turkey-mullein, alkali mallow, buckthorn or fiddleneck (*Amsinckia* spp.), alkali heliotrope, common spikeweed, common madia, poverty weed, telegraph plant, pignut, burweed (*Franseria* spp.), and western ragweed.

In the list of California plants given herein and designated as alien or immigrant, a few species are doubtfully included. This paper will not,



however, undertake a critical discussion of these cases. Their inclusion indicates that they are regarded as aliens by those botanists who have given most attention to the matter.

Under the term "alien" would be included introduced crop plants, ornamentals of all sorts, and many weeds. But not all introduced species can long maintain themselves without the care and attention of man; that is, they cannot persist without cultivation. On the other hand, certain introduced species may escape from cultivation or from the area where first they gained a foothold and may, with varying rapidity, become distributed over a larger area, growing independently of man's care.

Certain introductions are designated herein as "naturalized." These have been within our borders for a long period, are rather widely distributed, multiply readily, may compete more or less favorably with native species, and behave much as in their own natural geographical range. Other species, described as "adventive," are relatively recent introductions, less widely distributed than naturalized species and not so firmly established. Still others are "waifs"—a few chance escapes from gardens and other cultivated areas, even less firmly established than adventives and likely to disappear after a few years.

The criteria in judging a plant an alien are as follows: (1) its natural geographic range; (2) its prevalence about habitations, along highways, railroads, and in gardens and fields; (3) the presence of its seeds in imported crop seeds; and (4) its ability to compete successfully in native plant communities. For many of our aliens there is definite historical evidence as to dates and places of introduction. To illustrate application of the criteria, we will cite a specific weed. The widespread lamb's-quarters was fairly abundant when the pioneer settlers came to California. Accordingly, one might surmise that the species was indigenous, especially considering the lack of definite knowledge regarding the date and manner of its introduction. The earliest botanical collectors in the eastern United States, as well as in California, however, pronounced lamb's-quarters as immigrant because they found it growing about dwellings, along roadsides, in gardens and fields, and in other situations where man played a rôle, and not growing among native plants, competing favorably with them, or behaving like a native. These were good reasons for believing that the species was brought there by man and did not invade his gardens and fields from adjacent native habitats. Moreover, the seeds of lamb's-quarters were observed among those of crop plants from Europe, where the species is known to have a natural geographic range. There is therefore ample evidence that lamb's-quar-

ters is an alien. This species, however, is more definitely established as an immigrant than are many others. In each individual case we need bring forth various evidence of the kind indicated above.

### NAIADACEAE<sup>7</sup>

#### POTAMOGETON

Munz (1935) records *Potamogeton crispus* L. (curled-leaved pondweed) from the Santa Ana River near Corona. An early collection was made there in 1918. It is a native of Europe.

### ALISMACEAE

#### SAGITTARIA

*Sagittaria montevidensis* Cham. & Schlecht. (arrowhead), a native of Argentina, has been introduced at Stockton and Penryn.

### GRAMINEAE

#### AEGILOPS

There are three species of *Aegilops* in California, all introductions from Europe: *A. triuncialis* L. (barb goatgrass), now a troublesome, mechanically injurious weed on range and cultivated lands; *A. ovata* L. (ovate goatgrass), a weed in fields, reported from Mendocino County in the vicinity of Twin Rocks; and *A. cylindrica* Host. (jointed goatgrass), collected in August, 1939, in Siskiyou County.

Specimens of *Aegilops triuncialis* were collected in 1917 near Clarksville in the Sierra foothills; here, according to Kennedy (1928), "it was noticed for the first time about three years ago (in 1914) where some cattle from Mexico had been pastured. This season it is said to have practically destroyed a crop of wheat." The extent of the Calaveras infestation is indicated by Kennedy (1928): "According to Mr. Leonard of Calaveras County, it occurs first as scattered plants rapidly making solid patches, there being about 60 acres of thoroughly established general heavy infestation and an additional 200 acres of scattered infestation. It is troublesome on the grazing lands and slowly spreading to cultivated areas." Jacobsen (1929) gave its distribution:

From the upper reaches of Deer Creek, where this stream is crossed by the state highway to Placerville, westward to Clarksville in El Dorado County, thence spottedly south along Deer Creek and across the hills to Sloughhouse on the Consumnes

<sup>7</sup> The following annotated list of alien species attempts to give the earliest dates and places of occurrence and the geographical range of each species in California at the present time. For widely distributed species there seems little point, considering the main purposes of this paper, in indicating all localities where they have been collected, as recorded in herbarium specimens.

River. There appears to be . . . a gap between . . . infestations until Calaveras County is reached, where it is found abundantly in spots throughout its southwestern portion, extending over into eastern San Joaquin County and northwestern Stanislaus County.

In 1921, collections were taken in Yuba County. Although cattle avoid this plant on range lands, they can eat it with no ill effects and, if held on an infested area, will greatly reduce the infestation.

#### AGROPYRON

*Agropyron repens* (L.) Beauv. (quackgrass), from Eurasia, is exceptionally troublesome in the central northern states. Thousands of acres of the richest soils there are so overrun with quackgrass as to be scarcely worth cultivating. In California, thus far, it has very limited distribution and, although introduced early, appears unlikely to attain the importance it has in eastern United States. Brewer and Watson (1876) record it at San Francisco and elsewhere. Collections have been taken from Soquel in Santa Cruz County; Tehachapi Peak (altitude 6,000–8,000 feet), in 1895; Tulare County, in 1897; Funston's Meadows in the region of Kaweah Peaks, in 1897; the lower end of Donner Lake, in 1903; Del Norte County, in 1931; and at San Francisco.

*Agropyron junceum* (L.) Beauv. (rushlike wheatgrass), a Mediterranean species, was, according to Howell (1935a), first collected about 1885 at the outlet of Lake Merced by J. W. Congdon, "the only specimen heretofore known from California." In 1893 it was collected at Tocaloma in Marin County; in 1935, re-collected by Mrs. H. E. Tilden on the coastal sand dunes between the Cliff House and Lake Merced. Apparently this species is not spreading with any rapidity.

#### AGROSTIS

*Agrostis alba* L. (redtop), a native of Europe, was found at San Bernardino as early as 1892. Later collections were made at Los Angeles, and elsewhere in the state. *A. verticillata* Vill. (water bent), naturalized from Europe, is fairly well represented in Mendocino, Mariposa, and Inyo counties, south to southern California. *A. retrofracta* Willd. (hairy-flowered bentgrass) is an Australian species which has been found near Stockton.

#### AIRA

*Aira caryophyllea* (L.) Nash. (silver hairgrass), naturalized from Europe, is common throughout the state. *A. capillaris* (Host.) Hitchc., also an introduction from Europe, has been found in Sonoma and Humboldt counties.

**ALOPECURUS**

*Alopecurus pratensis* L. (meadow foxtail), a native of Europe, is sparingly naturalized in California.

**AMMOPHILA**

*Ammophila arenaria* (L.) Link. (European beachgrass), a native of Europe, was brought to the seacoast and sand dunes early as a sand-binder. It has well established itself in such habitats and has spread extensively.

**ANDROPOGON**

*Andropogon virginicus* L. (broomsedge) is apparently well established near Oroville. Agnes Chase writes in 1939: "A specimen of this was received a short time ago, the first in California. I surmise it has been recently introduced in some way." It is a native from Massachusetts to Texas, Mexico, and Central America.

**ANTHOXANTHUM**

*Anthoxanthum odoratum* L. (sweet vernalgrass), introduced from Eurasia, was listed by Brewer and Watson (1876), was collected by Davidson (1895b) at Los Angeles in 1895, and is described by Jepson (1923-25) as distributed in Humboldt and Del Norte counties.

**ARRHENATHERUM**

*Arrhenatherum elatius* (L.) Mert. & Koch. (tall oatgrass), introduced from Europe, is rare in California, being recorded by Jepson (1923-25) as adventive near Berkeley and at Jackson in Amador County. It has not become established to any extent on our range lands.

**ARUNDO**

*Arundo Donax* L. (reed grass), native to the warm regions of the Old World, occurs along irrigating ditches in central and southern California. According to Parish (1890-91), "an aged Mexican informed Mr. Lyon that as early as 1820 it was so plentiful along the Los Angeles River that it was gathered for roofing material, for which it was preferred to the tules commonly used." It was probably introduced during the Mission Period. It was collected at Los Angeles, 1889; near Redlands, 1894; and San Gabriel River, 1918.

**AVENA**

*Avena fatua* L. (wild oat) is regarded as an introduction from Europe. Although widespread in the United States, it is most troublesome as a



weed in the Northwest, along the Pacific Coast, and in the prairie provinces of western Canada. In California, however, it ranks as an important range plant, although in certain crops it may be a serious weed.

From a study of the seeds found in adobe bricks from old buildings whose construction dates are known, Hendry and Bellue (1925) have evidence that *Avena fatua* was among the many plants growing in Alta California during the Spanish or Mission Period (1769–1824). Their studies lead them to conclude: "We have scant evidence of wild oat in California until after 1800, but subsequent to this date we find *Avena fatua* abundantly in some of the San Francisco Bay region buildings."

Brewer and Watson (1876) say that wild oat is common in fields. Parish (1890–91) writes as follows:

The wild oat (*Avena fatua*), although possessing an objectionable awned seed that is capable of boring into the flesh and causing much annoyance and damage, yet has sufficient value to overbalance its evil qualities. In places it covers hundreds of acres with self-sown grain. It forms a luxuriant pasture, starting up with the first rains and requiring less moisture than the cultivated grains. . . . Cut early, it makes a hay . . . much relished by horses and mules. Although present . . . in all Californian grain fields, it is not often injurious to them, unless very foul seed has been used. In what are called "volunteer crops"—that is, self-sown ones—it is frequently so abundant that they must be cut for hay. Although so valued by us, it has acquired a bad reputation in some of the older states. . . . Thus, having been accidentally introduced some years ago in . . . Wisconsin, it is said to have soon taken possession of the land, effectually running out any other crop, and becoming the worst pest of the region. . . . To the plant-eradicating sheep, which have wrought such destruction to our native flora, . . . California owes the introduction of its most valuable and abundant forage plants, namely alfalfa, bur-clover, and wild oat.

Hilgard (1890) says:

The wild oat (*Avena fatua*) is so generally diffused . . . that it is commonly considered indigenous, since it is mentioned by the early explorers as covering the hill-sides of the coast ranges as well as Sierra foothills. While an unwelcome guest in the grain fields, it is highly esteemed for hay, despite its hirsute glumes that, when too ripe, sometimes give trouble in "choking" cattle not used to it.

Davy (1902), studying the stock ranges of northwestern California, writes concerning the influence of wild oat on that territory, always rated among the superior natural ranges of California:

Few residents of this region are sufficiently familiar with plants to define the actual changes . . . over a period of years. Some, however, have noticed the change in composition of the range feed. Mr. Bell, Mr. Joseph H. Clarke, and others state that danthonia and other "bunch grasses," wild oats, alfalfa, clovers, wild-pea vines (*Lathyrus* sp.), and wild sunflower (*Wyethia* sp.) were formerly the most abundant plants on the ranges. All these, they state, have been materially reduced, . . . and in their places squirrel tail, small barley grass, and soft chess have become established since they settled in the county. . . . Menefee, writing in 1873, says of this section



of Mendocino County, "The soil is . . . covered with a rich growth of clover, wild oat, bunch grass, and rosin weed or wild sunflower." All of the above-named plants are now relatively scarce.

Wild oats and alfilerilla were not, however, the primitive forage plants, . . . their introduction . . . probably dating from the Spanish occupation. Being adventive, they too must have replaced other plants which were probably native, . . . since we have no records of immigration earlier than that of the Mission Fathers. . . .

On account of their wide distribution in the State, and their abundance and prevalence in the fifties, many persons have refused to believe that wild oats and alfilerilla could be other than native to the soil; even Bolander, writing in the early sixties, was inclined to believe that they must be native alike in southern Europe and California. To anyone who has watched the rapid spread of alien weeds in the rich soil and favorable climate of this state, and has observed one alien gradually give place to others, the century and a quarter . . . since the Spanish occupation will appear none too short to witness the occupation of the whole state by such prolific plants as wild oats and alfilerilla, and the later appearance of one or both of them by overstocking. . . .

Col. Redick McKee, United States Indian agent, with a military party, passed over the plateau region from Santa Rosa to Humboldt Bay in the fall of 1851. Mr. George Gibbs, who kept the official diary of the party, mentions that wild oats were very abundant on the slopes of the lower foothills from Santa Rosa northward. Before reaching Feliz Valley, the most northerly Spanish ranch in the Russian River Valley, he notes: "The hills passed today were covered with bunch grass, the wild oats having disappeared." Wild oats were again observed on what is now known as Walker Mountain, but were not noted from any place to the northward, though bunch grasses are frequently mentioned. There is no mention of alfilerilla. Col. McKee's party seems to have been only the second white party to make the overland trip.

As late as 1913, Parish (1913) states that after two explorations of the Imperial Valley he found no *Avena fatua* as well as no specimens of several other weed species. Again (1920) he remarks, "The wild oats must have been among the earliest introductions of the Mission era, and being well suited to the conditions, have spread with rapidity."

Newberry (1857) says that in 1855, throughout central and southern California, wherever the ground was not occupied by forests, wild oat "covered surfaces of many hundreds of miles in extent as completely as the grasses cover the prairies of Illinois." He was inclined to regard it as indigenous. The report indicates that at this early date it was even more abundant than today, the increase of cultivation having curtailed its area.

Wild oat is frequent in cultivated grounds, especially as "volunteer" in grain fields, but it occupies great tracts of hills and plains. It affords good pasturage and in early years was extensively reaped for hay. By way of California, doubtless, the wild oat has reached other parts of the United States.

Clements (1920) suggests that the Great Valley of California, from

Bakersfield to Mount Shasta and from the foothills of the Sierra Nevada and Cascade Mountains, through and over much of the Coast Range was originally a grassland of the bunch-grass type, with *Stipa* as the most dominant species, and that this has been almost entirely replaced by the introduced annual grasses (*Avena fatua* and *A. barbata*). Cooper (1922), on the basis of assumed relicts, believes that the chaparral was the climax vegetative covering the edges of the Great Valley, a supposition which does not exclude the possibility of a climatic grassland over much of the Great Valley itself.

Aldous and Shantz (1924) describe briefly 102 "vegetation types" of the semiarid portion of the United States, including the "weed grass" type, as

... limited chiefly to California where it is the principal type on the valley floors and lower foothills on lands containing little alkali. It consists of a more or less even stand of annuals or short-lived grasses, chief among which are three species of brome grass (*Bromus* species), wild oats (*Avena fatua*), and filaree, also known as alfilaria (*Erodium cicutarium*)... It indicates land from which the original vegetation has been driven out by overgrazing. In California this was done during early Spanish days... It supplies practically all the feed in the unimproved pastures and ranges in the valleys and lower foothills of California.

According to Bauer (1930), *Avena fatua* is a characteristic plant of the grasslands of the Tehachapi Mountains.

Piemeisel and Lawson (1937), studying the San Joaquin Valley, state that in the tree savanna the perennial cover among the oaks has been replaced by an annual cover of grasses and herbs, chief of which are *Avena fatua* and other alien plants. The Pacific grassland, originally dominated by perennial grasses, has been overgrazed, and such areas are now occupied by annuals, with *Avena fatua* dominant.

*Avena barbata* Brot. (slender oat) is also regarded as an introduction from Europe. Although first reported from California by Vasey (1885), it is generally believed to have been introduced much earlier. Parish (1899) writes as follows:

Although it is only within recent years that this species has been reported from California, it has evidently been established, at least in the southern counties, from very early times, but has been confused with *A. fatua*, and it is probable that many specimens in herbaria under the latter name will be found really to belong to this species. Both occur throughout the intramontane region. In San Bernardino and Riverside counties *A. fatua* is the more common, but in many parts of San Diego County (Santa Ysabel, Julian, Pensaquitas Ranch, Poway, etc.) *A. barbata* is much more abundant, and often over large areas the exclusive species.

*Avena sativa* L., the cultivated oat, a native of Europe, is an occasional escape.

**BRACHYPODIUM**

*Brachypodium distachyon* (L.) Beauv., an adventive from Europe, was collected by R. D. Roseberry on June 10, 1935, 2½ miles northwest of Golden Gate Hill, Calaveras County, at an elevation of 1,300 feet. It was associated with slender oat, soft chess, red brome, and bur clover.

**BRIZA**

The three species of *Briza* in California are European introductions. *Briza minor* L. (small quaking grass) is becoming fairly common in central California; and Munz (1935) records it at the San Diego River. *B. maxima* L. (large quaking grass), an ornamental garden plant, has sparingly escaped. Davy (1898*d*) reports it near Healdsburg. *B. media* L. (medium quaking grass) has been collected in Sonoma County.

**BROMUS**

*Bromus arenarius* Labill. (Australian chess), an occasional weed in central and southern California, is an introduction from Australia. Parish (1920) states that a few plants were first collected in Waterman Canyon, San Bernardino, in 1905. Other early collections were at Saratoga in 1910; at Shoestring Mine and Tejon Pass, in 1914; near Barstow and "The Cave" in a remote part of the Ivanpah Mountains in 1915; and at Red Hill, near Uplands, in 1917.

*Bromus brizaeformis* Fisch. & Mey. (rattlesnake chess), also an introduction from Europe, is occasionally cultivated as an ornamental. It is infrequently found in northern California. It grows sparsely in the foothills, the young plants being grazed by livestock with some relish. It was collected at Gazelle in Siskiyou County in 1905 and at Massock in Plumas County in 1913.

*Bromus catharticus* Vahl. (rescue grass) is probably a native of South America. It is grown in the southern states for winter forage. It has occasionally escaped from cultivation, especially in southern California, where it is rare in waste places, fields, and sometimes on the desert. Parish (1913) states that it is "common in cultivated fields, in gardens, about houses, and by roadsides; in like places in the Mojave Desert, at Barstow, and in Panamint Valley." It has some value as a forage plant.

*Bromus commutatus* Serad. (hairy chess), from Europe, occurs in fields and waste places at lower altitudes throughout the state. It is sparingly found on the range. It was collected at San Francisco in 1880, at San Bernardino in 1891, and at Redlands and Orange in 1902.

*Bromus inermis* Leyss. (smooth brome) is a native of the Hungarian

plains and the Russian steppes. About 1880, the California Agricultural Experiment Station introduced it into the United States, where it was planted extensively as a pasture and hay crop. It has occasionally escaped from cultivation and may grow in a volunteer fashion on ranges.

*Bromus japonicus* Thunb. (Japanese chess) is occasionally found as a weed in California. Munz (1935) records it as a waif in the San Jacinto Mountains. It is a native of the Old World.

*Bromus madritensis* L. (compact chess) is a European species collected, according to Parish (1920) at Fort Tejon in 1887, "the first reported collection in the United States." Other early records are from San Emigdio Canyon in Kern County in 1896, San Jose in 1896, near Ten Mile House in Mendocino County in 1896, and Santiago Peak in Orange County in 1904. It is also found at Antioch, and in Amador County.

*Bromus mollis* L. (soft chess) has become widely scattered in California in waste places, on cultivated soils, and on ranges, especially in the coastal region. It is naturalized from Europe. Parish (1890-91) states: "*B. mollis* has been sent me by Dr. H. E. Hasse, who collected it in May of the present year at Santa Monica, under conditions which made evident its recent intrusion. There is no record of its having been found previously in the state." Hilgard (1890) reports it as common on roadsides and in neglected fields, evidently referring to northern California. Jepson (1893) records it from Napa Valley. According to Davidson (1896) it was not common at Los Angeles in 1896; but was abundant at Santa Ysabel and Oceanside. Davy (1902) reports it as a prevalent grass on the ranges of northwestern California. In some localities it has taken possession of depleted range lands. As a pasture grass it is the best of the annual bromes.

*Bromus rigidus* Roth, and its variety *Gussonii* (Parl.) Coss. and Dur. (ripgut grass), weedy grasses naturalized from Europe, have become very common throughout the state, the species relatively abundant in the southern half, the variety more common than the species in the central and northern half. Brewer and Watson (1876) record the species from San Francisco, where Eastwood also collected it in 1898. Parish (1890-91), who first observed it in 1888 in the foothills of San Bernardino, remarks that "the earliest collection in the state was in a cultivated field at Mission Dolores, San Francisco, in 1862." Other early records are for Lake Tahoe, 1899; Orange and Lytle Creek in the San Antonio Mountains, 1900; Castroville, 1901; and the Mojave Desert, 1915. Davy (1902) states that the variety *Gussonii* is a dominant plant of the ranges in northwestern California.



*Bromus rubens* L. (red brome), naturalized from southern Europe, is common throughout California at lower altitudes. It is, in fact, one of the most obnoxious weeds, especially in southern California, having come to replace much of the native vegetation. Brewer and Watson (1876) record it. An early collection was in Plumas County in 1880. Parish (1909) first noticed this species (with *B. rigidus* var. *Gussonii*) along the sides of the San Bernardino Valley in 1888, being introduced in foul grain seed. Two years after, the weeds had spread for a mile along the roadsides of the two canyons in which they first appeared. Parish states: "The diffusion of both bromes continued with increasing rapidity, and in a very few years large patches of either could be found in all parts. . . . They are now among the most widespread, abundant and well-established grasses of the region. By roadsides and in waste places, in pastures and in cultivated fields, on dry mesas and hillsides these pestiferous grasses abound." Other early collections were at Palm Springs in 1913 and in the Mojave Desert in 1915.

*Bromus scoparius* L. (broom brome) in California is a rare, introduced European plant found at Santa Barbara and Mariposa.

*Bromus secalinus* L. (chess) native of Europe, has not yet become a common weed in grain fields of California, as it has elsewhere. It is sometimes a weed on range lands, although in winter and early spring it furnishes some forage. Brewer and Watson (1876) record the species. According to Parish (1890-91), it had not been detected up to that date in southern California. In 1893, however, it was collected at Glendale and Los Angeles. Munz (1935) reports it as an "occasional waif."

*Bromus sterilis* L. (barren brome), a Mediterranean species, occurs sparingly in waste places. Bolander (1870) records it from near San Francisco. It was collected in 1897 at Matilija in Ventura County, and in 1916 along the Eel River from South Fork to Scotia.

*Bromus tectorum* L. (downy chess) and its variety *nudus* Klett & Richt. are common escapes throughout California, especially above 3,000 feet elevation on the east side of the Sierras. They are introductions from the Mediterranean. According to Parish (1920) early collections were made at Yosemite in 1900, Klamath River in 1901, Sisson in 1902, Yreka in 1904, Santa Barbara in 1910, and Upland, 1918. Although one of the less palatable alien bromes, before it matures it supplies considerable forage on many ranges.

*Bromus Trinii* Desv. (Chilean chess) occurs from Siskiyou County southward, especially in the desert regions. It was introduced from Chile. *B. molliformis* Lloyd and *B. racemosus* L. (upright chess), both introduced from Europe, are infrequently weeds within our borders.



### CENCHRUS

In October, 1937, Gander (1937) collected *Cenchrus echinatus* L. (burgrass) at La Mesa in San Diego County. This is a common weed in tropical America.

### CHLORIS

There are three introduced species of *Chloris* in California. *Chloris distichophylla* Lag., from South America, occasionally escapes from cultivation in the southern part of the state. Gander (1937) reports several collections from near San Diego. *C. Gayana* Kunth (Rhodes grass), introduced from Africa and cultivated somewhat as a forage plant, is occasionally an escape, being recorded by Gander (1937) at one locality in southwestern San Diego County. *C. verticillata* Nutt. (windmill grass), a native of Texas, is adventive at Berkeley.

### CRYPISIS

*Crypsis aculeata* (L.) Ait. (sharp-leaved crypsis) occurs on the overflowed lands of the Sacramento and San Joaquin valleys. It is a native of Europe.

### CUTANDIA

An introduction from the Mediterranean region, *Cutandia memphitica* (Spreng.) Richt. is adventive in the San Bernardino Mountains.

### CYNODON

*Cynodon Dactylon* (L.) Pers. (Bermuda grass) ranks among the worst weed pests of California. A native of the warmer parts of the Old World, it is now widely distributed in California in regions where the winters are not severe enough to kill roots and rootstocks. It is of interest to note that William C. Walker, a nurseryman of San Francisco, listed Bermuda grass in his catalog of 1858, at \$5.00 a flat. Brewer and Watson (1876) report it near San Bernardino and San Jose. Bolander (1870) finds it near San Francisco. Hilgard (1890), however, does not list it among the weeds of California. Parish (1890-91) records it from the southern counties, and Davy (1898b) from Calaveras County. Parish (1913) found it in the Colorado Desert, frequent in fields and about houses. Parish (1920) states: "Although now so abundant, it probably was not a very early introduction, at least in the south. At San Bernardino it was still rare about 1880, and I have found no early record of its presence in the state."

A form of this species (called *Cynodon maritimus*), coarser and

ranker than the typical form, is common in the Imperial Valley, and has also been found at West Anaheim in 1934, at Yorba Linda in 1935, and at Chino in 1939.

#### CYNOSURUS

There are two species of this genus in California, both adventive from Europe. *Cynosurus cristatus* L. (crested dogtail) occurs at Los Angeles. *C. echinatus* L. (dogtail grass) has been found there and also in Marin County.

#### DACTYLIS

*Dactylis glomerata* L. (orchard grass), a European species, often cultivated, has occasionally escaped from cultivation, as at San Bernardino, 1886; San Francisco, 1898; Claremont and Pomona, 1918. It may be found along roadsides and in waste places throughout the state at moderate elevations.

#### DIGITARIA

*Digitaria sanguinalis* (L.) Scop. (hairy crabgrass), a common naturalized weed from Europe, is listed by Brewer and Watson (1876). Parish (1890-91) notes that in the southern counties crabgrass "is abundant in cultivated districts, as . . . in most of the warmer regions of the world. . . . It is especially prevalent in orchards, corn fields, and gardens." Parish (1920) calls it "a common and long-established weed in cultivated grounds, as abundant thirty-five years ago as now." Today crabgrass has become a troublesome weed of lawns throughout the state, along roadsides, in waste moist places, and on levees.

*Digitaria Ischaemum* (Schreb.) Muhl. (smooth crabgrass) is reported from Pasadena, and from San Diego County. According to Ball (1936), it is becoming increasingly frequent, especially in lawns near Petaluma. It is a native of Europe.

#### ECHINOCHLOA

*Echinochloa Crusgalli* (L.) Beauv. (watergrass), an introduction from Europe, is now found in almost all agricultural sections of California. Torrey (1856) collected it "on the Sacramento" in 1838-42. Brewer and Watson (1876) find it "common in rich ground." Bolander (1870) notes it near San Francisco. Parish (1920) calls it "long-established; at San Bernardino as abundant in 1880 as at present."

*Echinochloa colona* (L.) Link (jungle-rice), a native of the Old World, is occasionally found in southern California, where Brewer and Watson (1876) list it from San Diego County. According to Parish (1920), Congdon collected it at Visalia in 1881. Parish (1920) found it an abundant weed in the cultivated parts of the Salton Sea in 1913. It has also been collected at Orange, Riverside, and Upland.

**ELEUSINE**

*Eleusine indica* (L.) Gaertn. (goosegrass) has been found sparingly at Los Angeles and San Diego, where it was supposedly introduced in clover seed of lawn-grass mixtures. It is a native of the Old World.

**ELYMUS**

*Elymus Caput-Medusae* L. (Medusa-head), from Europe, is spreading in certain northern coastal counties. It occurs at Yreka, at Klamathon in Siskiyou County, near Ruth in Trinity County, near Hunter's Point in Lake County, at Ukiah, and at Los Gatos. Recently specimens have been taken on range lands in Placer County, where it is reported as spreading at a very rapid rate. A recent letter (June 15, 1939) from L. L. Cooper, Ukiah, states that his "entire range is covered with this grass, which is useless from a livestock pasturage point of view." He claims that his sheep are starving on this feed, and further states that rotation grazing has been of no value as the grass thrives equally well on pastured or nonpastured range. Since, as stockmen report, animals will not eat this grass, it threatens to become a range weed of major importance.

**ERAGROSTIS**

*Eragrostis cilianensis* (All.) Link (stinkgrass) is common at lower altitudes throughout California. Brewer and Watson (1876) record it from San Francisco and Monterey. It is also reported from Tehama County, Butte County, Los Angeles, San Bernardino, West Riverside, Mecca, and elsewhere. It is a native of the Old World. *E. Barrelieri* Daveau., from southern Europe, is cited by Hitchcock (1935) from Fresno. *E. pilosa* (L.) Beauv. (India lovegrass) is an introduction from Europe, found by Parish (1890-91) "in 1882 growing along the embankment of an irrigating canal, near Santa Ana, Orange County"; by Kennedy (1923) "occurring abundantly in the laterals in the rice-growing sections, where it impedes the flow of water." *E. poaeoides* (L.) Beauv., (low eragrostis), also from Europe, was collected at Larkens, San Diego County, in 1875, and in Amador County in 1896.

**ERIOCHLOA**

*Eriochloa contracta* Hitchc. (prairie cupgrass) is a native from Kansas to Louisiana and New Mexico. Recently specimens have been received from Merced, its first occurrence in California.

**FESTUCA**

There are three introduced species of *Festuca*, all natives of Europe. *Festuca Myuros* L. (rat's-tail fescue) was collected by Torrey (1856) at

San Francisco as early as 1838-42, and recorded by Brewer and Watson (1876) at Monterey in 1861. According to Parish (1920), it was abundant at San Bernardino in 1882. Other early collections are as follows: Elsinore, 1888; Jackson and Berkeley, 1892; San Diego, 1894; Eureka, 1896; Pomona and Tulare, 1897; Ukiah, 1899; Pine Ridge in Fresno County, 1900; St. Helena, 1902; Riverside, 1903; Pasadena, 1905; and Fort Seward, 1914. Davy (1902) cites this among the prevalent grasses of the northwestern California ranges.

*Festuca elatior* L. (meadow fescue), cultivated to some extent, has infrequently escaped into waste places and fields. It was collected at Los Angeles and Santa Monica in 1892, at Pasadena in 1895. *F. dertonensis* (All.) Aschers. & Graebn. is only occasional in California.

#### GASTRIDIDIUM

*Gastridium ventricosum* (Gouan) Schinz & Thell. (nitgrass) is becoming common in the coast counties. Brewer and Watson (1876) report it from San Francisco and San Diego, stating that late in the season it covers the dry hills everywhere. Parish (1920) reported a few plants at San Bernardino in 1907. Nitgrass is a European species.

#### HOLCUS

*Holcus lanatus* L. (velvet grass), introduced from Europe and used somewhat as a meadow grass, has occasionally escaped from cultivation. Brewer and Watson (1876) remark that it is "introduced and naturalized around settlements in various parts of the state." Bolander (1870) records it near San Francisco. Other early collections were at Pasadena, in the Cuyamaca Mountains, in 1894, and at San Jacinto in 1895. We have specimens from Placerville, Stockton, and Fort Seward. *H. mollis* L. (creeping velvet grass), another European species, has been collected at Santa Rosa in 1902, Eureka in 1914, and Mendocino Pine Barrens in 1931.

#### HORDEUM

*Hordeum murinum* L. (common foxtail), a European species, is a common and abundant weed in California. It is one of the most widely distributed grasses in overgrazed range and pasture lands. Seeds were found in adobe bricks from missions constructed in 1775 and in 1780. Brewer and Watson (1876) report it from San Diego and San Francisco. As early as 1890 Hilgard (1890) described it as a "fearful nuisance" in central California. Davy (1902) reports it as rapidly coming in on the ranges of northwestern California.

*Hordeum Gussoneanum* Parl. (Mediterranean barley), also intro-



duced from Europe, has become fairly common, especially in northern California. Davy (1902), studying the ranges of northwestern California, finds it among the prevailing grasses on valley floors and on "upland ranges." In southern California it is recorded from Warner's Ranch, and from Shoestring Mine in the Antelope Valley, and from Arrowhead Lake.

#### LAGURUS

Jepson (1923-25) records *Lagurus ovatus* L. (hare's-tail grass), a European native, as sparingly escaped from cultivation along the coast only at San Francisco, Berkeley, and Monterey.

#### LAMARCKIA

*Lamarchia aurea* (L.) Moench. (golden-top), a native of the Mediterranean region, is sometimes cultivated as an ornamental. Having escaped from cultivation, it is now common in waste places, particularly at lower altitudes in southern California. Parish (1890-91) says: "First collected in the United States by Parry and Lemmon in 1875, a few plants only, at the mouth of Mill Creek, San Bernardino Mountains, but probably already established about Los Angeles, where found in great abundance by Parry in 1881, although at that date it was still rare about San Bernardino." It was collected at San Luis Obispo in 1889 and at San Jacinto in 1891. In central California the earliest collection, according to Parish (1920), was by Davy in 1893 at Edendale, Santa Clara Valley. Other localities are Betteravia, Table Top Mountain in Calaveras County, San Diego, Moorpark in Ventura County, and Monterey and Santa Cruz counties.

#### LEPTURUS

*Lepturus cylindricus* (Willd.) Trin. (thintail) occurs in mudflats and salt marshes from San Francisco Bay to San Diego. Collections have been made at Oceanside, 1897; Ballona, 1901; Mesmer, 1902; La Jolla, 1917; Colegrove, 1915; and later at San Francisco and Stockton. The species is of European origin.

#### LOLIUM

The four adventive species of *Lolium* in California are natives of Europe. *Lolium multiflorum* Lam. (Italian ryegrass), a common lawn grass, has occasionally escaped from cultivation, extending on to certain range lands. It also occurs along roadsides and in fields and waste places. Seeds were found in adobe bricks of Santo Domingo Mission, constructed in 1775. It was collected at San Bernardino in 1891, at Ojai in 1896.

*Lolium perenne* L. (perennial ryegrass), although relatively rare in

California, occurs on some ranges. Brewer and Watson (1876) report it from San Francisco; Jepson (1923-25) from Mt. Shasta, Ferndale, Mendocino County, and Fresno County.

*Lolium temulentum* L. (darnel) is common, being recorded by Brewer and Watson (1876) from San Francisco, Walnut Creek, and San Diego. Other localities given by Jepson (1909-36) are Hupa Valley, Norman, Yosemite Valley, Ojai Valley, Inglewood, Pasadena, San Bernardino, and The Needles. We have specimens also from Fort Seward. *L. subulatum* Vis. (narrow-spiked ryegrass) has been found at West Berkeley.

#### ORYZOPSIS

*Oryzopsis miliacea* (L.) Benth. & Hook. (rice grass) occurs sparingly in waste places at Los Angeles, Ventura, Santa Barbara, Monrovia, and Colito in Mendocino County. Early collections were at Los Angeles in 1896, at Santa Barbara and Monrovia in 1916. It is naturalized from the Mediterranean region.

#### PANICUM

*Panicum capillare* L. (witchgrass), probably from the eastern United States, is rare with us. Bolander (1870) reports it from San Francisco. It has been found at Upland, along the Santa Ana River, at Pine Grove in Amador County, and about Davis in Yolo County. *P. dichotomiflorum* Michx. (fall panicum) is occasionally found in cultivated soil at Fresno and southward. It is a native of eastern United States. *P. miliaceum* L. (hog millet), an Old World species, has escaped here and there from cultivation. It was collected at Riverside in 1910 and 1918, at Upland in 1917, and is also known from Kenwood and Sacramento.

#### PASPALUM

*Paspalum dilatatum* Poir. (Dallis grass), a native of South America, is now occasionally grown as a pasture grass. It has escaped from cultivation at Los Angeles, Redlands, Whittier, Santa Cruz, San Jose, and in the San Joaquin and Sacramento valleys. *P. Urvillei* Steud. (Vasey grass), also South American, has been found in irrigation ditches at Berry Creek in Butte County and at Palm Springs Station in 1913.

#### PENNISETUM

Of *Pennisetum clandestinum* Hochst. (Kikuyu grass), Ball (1935) writes as follows:

Kikuyu grass, although not new to California, became prominent . . . the past year. An inspection was made of this plant growing in avocado and orange groves in San Diego County, where it had been planted to prevent soil erosion. . . . The extremely favorable conditions for its growth made excessive competition for the trees, the

result being death or definite disorder. A state survey was made. It was learned that kikuyu grass was imported about fifteen years ago from Africa, propagated, and distributed to several coastal counties. Other than San Diego County, it was found in Orange, Ventura, Santa Barbara, and San Luis Obispo, and reported to be in Los Angeles and Monterey counties. It is used both for lawns and to prevent soil erosion. Its use for the latter purpose so far has been confined to controlled test plantings.

Most plants in California bear staminate flowers only, but complete flowers were first observed at Santa Ana, January, 1938, and seedlings at Yorba Linda, September, 1938.

*Pennisetum Ruppellii* Steud. (fountain grass), from Africa, is cultivated for ornament. Gander (1937) reports it as an escape at San Diego. *P. villosum* R.Br. (feathertop), also African, is sometimes cultivated as an ornamental. It has been found as an escape in the hills near Santa Barbara in 1908 and 1916, and at Ventura in 1916 and also at San Diego.

### PHALARIS

The following five species of *Phalaris* are native to the Mediterranean. *Phalaris brachystachys* Link. (short-spiked canary grass) has been found in waste ground at Nelson, Butte County. It is a rice-crop weed of some importance.

*Phalaris canariensis* L. (canary grass), an occasional waif in California, is recorded by Brewer and Watson (1876) and is also known from Yreka, San Diego, Pasadena, Berkeley, and Monterey.

*Phalaris caroliniana* Walt. (Carolina canary grass) was collected in 1901 at Palms in Los Angeles County, and in 1903 at San Diego and Ojai.

*Phalaris minor* Retz (Mediterranean canary grass) was collected at San Bernardino in 1882 and at Playa del Rey in 1918. It is also recorded from San Diego, El Monte, Claremont, and La Jolla. Its usual range in California is the central and southern portions. In rice fields it is a common weed.

*Phalaris paradoxa* L. var. *praemorsa* (Lam.) Coss & Dur. (gnawed canary grass), according to Davy (1898*d*), was found in abundance near Princeton, Colusa County. It was collected at San Diego in 1902 and at La Brea Ranch in 1916. It is rather widely distributed today, especially in grain fields, including rice.

*Phalaris tuberosa* L. var. *stenoptera* Hack. (Hitchc.) (Harding grass) is an Australian species, collected four miles north of Loleta in 1937. Specimens were recently sent in from El Cajon, where it has been growing under dry-land conditions for over ten years, but without spreading to any extent.

### PHLEUM

The common hay plant, *Phleum pratense* L. (timothy), from the Old World, has escaped in many parts of the state. According to Vasey and Rose (1890), as early as 1888 it was collected at Victorville. Later collections were in 1917 at Riverside, and in 1918 at Santa Monica and Claremont. Munz (1935) records it at Cuyamaca, Hemet Valley, Bluff Lake, and elsewhere.

### PHOLIURUS

*Pholiurus incurvus* (L.) Schinz & Thell. (sickle grass), a naturalized species from Europe, occurs along the seacoast from Marin County to San Diego. Early collections were made at San Diego in 1902, Pebble Beach in 1916, Ventura in 1910, and Santa Barbara.

### POA

The *Poa* species introduced into California are all European. *Poa annua* L. (annual bluegrass) was brought in very early, for seeds were found in adobe bricks of San Juan Bautista, constructed in 1797. The Russian collection in Sonoma County (1840–41) contained this species. Torrey (1856) reports that in 1838–42 it was very common in California. Brewer and Watson (1876) collected it in the 60's, and Bolander (1870) noted it near San Francisco. Other early collections were in the Cuyamaca Mountains, 1893; in the San Antonio Mountains, 1900; at Big Meadows, in San Bernardino County and the Mojave Desert in 1906; and at Granite Wells in 1915. It now occurs throughout the state in open ground, in lawns, pastures, range lands, open woods, and waste places.

*Poa compressa* L. (Canada bluegrass), though infrequent as an escape, is sometimes troublesome. Parish (1920) states it was infrequent in the streets of Los Angeles in 1918. *P. pratensis* L. (Kentucky bluegrass) is extensively cultivated and some forms of it have escaped, especially at lower altitudes. *P. trivialis* L. (rough bluegrass) has been found in Humboldt County.

### POLYPOGON

*Polypogon monspeliensis* Desf. (rabbitfoot grass) is a European weed common throughout California at moderate altitudes. Bolander (1870) lists it near San Francisco. Parish (1890–91), referring to the southern counties, says: "It is a common grass throughout all this region, but not 'chiefly in the mountains,' as Dr. Thurber supposed. . . . It mostly abounds in the meadows and pastures of lower altitudes, and especially . . . where the soil contains a taint of alkali." It has also been recorded from Furnace Creek, 1891; Antelope Valley, 1893; Surprise Canyon,



1908; Mecca, 1913; and Post Office Spring, 1915. Kennedy (1923) lists it as an important weed of rice fields, especially aggressive on overflowed areas, where the water becomes stagnant for the want of an outlet or from underdrainage. *P. lutosus* (Poir.) Hitchc. (ditch beardgrass), a European introduction, occurs from Siskiyou County to San Diego County. *P. maritimus* Willd. (maritime beardgrass), also naturalized from Europe, is found in central California.

#### PUCCINELLIA

Munz (1935) reports *Puccinellia distans* (L.) Parl. (spreading meadowgrass), a native of Europe, as introduced in wet places, at San Diego. *P. maritima* (Huds.) Parl. is a European species collected on the flood plain of Little Panoche Creek in western Fresno County and at Hayward in Alameda County.

#### SCHISMUS

*Schismus barbatus* (L.) Chase, a native of southern Europe, India, and Africa, has been introduced into southern Arizona. Hoover (1935) found specimens five miles south of Huron in Fresno County.

#### SETARIA

The species of *Setaria* growing without cultivation in California are all of European origin. *Setaria lutescens* (Weigel) F. T. Hubb (yellow bristlegrass) was introduced early, Torrey (1856) collecting it on the Sacramento in 1838-42. Brewer and Watson (1876) report it from Sacramento and elsewhere. According to Hilgard (1890), it is "a terrible pest in the irrigated alfalfa fields of the foothills." It was collected at Los Angeles in 1892, at Riverside in 1897, at San Bernardino in 1907, at Santa Barbara in 1916. Hitchcock (1935) records specimens from Chico, and Jepson (1909-36) adds Fresno and Three Rivers.

*Setaria viridis* (L.) Beauv. (green bristlegrass) occurs in southern California and in the Sacramento and San Joaquin valleys. Parish (1920) reports it from San Bernardino in 1916; Munz (1935) from Los Angeles, Rialto, and Oceanside. Kennedy (1923) finds it as frequent in the rice fields of northern California; and Bellue (1938) in the Sacramento and San Joaquin valleys. *S. verticillata* (L.) Beauv. (bur bristlegrass) occurs chiefly in southern California. It has been collected at Upland, and a few infestations are reported from San Joaquin County.

#### SORGHUM

*Sorghum halepense* (L.) Pers. (Johnson grass), a native of southern Europe and Asia, was introduced from Turkey into South Carolina by

Governor Means about 1830. About ten years later, seed from these plants was sown by Col. William Johnson on his plantation in the fertile bottom lands of the Alabama River, near Salem. Long used for forage throughout the South, the plant has become thoroughly naturalized. It has spread as far north as New Jersey, Pennsylvania, Missouri, Iowa, and Kansas; and along the west coast through California to Oregon and Washington. Although originating in a warm climate, it has apparently adapted itself to a wide range of conditions.

The introduction of Johnson grass into California (about 1884) was probably for forage, but the seed also arrived as an impurity in commercial seeds. Parish (1890-91) states:

A plant with an unusual number of popular aliases was introduced to cultivation in California under the name of Evergreen Millet some six years ago, and with such high laudation that farmers very generally experimented with it. The results were not satisfactory, . . . and its culture is entirely abandoned. It remains, however, as a naturalized plant, . . . at least in the San Bernardino Valley, by stream banks, roadsides, and sometimes as a troublesome weed in arable lands.

Hilgard (1890) says that Johnson grass "has in some sandy soils proved an almost ineradicable pest." For several years it has been a common impurity in shipments of other seeds; the data on the presence of noxious weed seeds in Sudan grass manifest the increase of Johnson-grass infestation. It is now extensively distributed in nearly all farming sections of the warmer parts of California, where it is designated as a "primary noxious weed."

#### TRICHOLAENA

*Tricholaena rosea* Nees. (Natal grass), naturalized from South Africa, is sometimes cultivated as a meadow grass in sandy soil. Gander (1937) reports it as an escape at three localities in San Diego County.

#### TRisetum

*Trisetum flavescens* (L.) Beauv. (yellow false oat), an introduction from Europe, is recorded by Jepson (1923-25) from Blue Lake in Humboldt County.

### CYPERACEAE

#### CYPERUS

*Cyperus rotundus* L. (nutgrass), an introduced species from the tropics and from Europe, was long considered local in southern California, but is now known in scattered localities northward. It is particularly obnoxious in lawns, in gardens, and in fields of the Delta region. It was collected at Colton in 1891, at Upland and Riverside in 1918. Its close relative, *C. esculentus* L. (chufa), also known as nutgrass, is a native

species. *C. alternifolius* L. (papyrus), a Madagascar species, is reported by Munz (1935) as an occasional escape in Liveoak Canyon, San Gabriel Mountains. *C. difformis* L., a native of the Old World tropics, occurs in the Sacramento and San Joaquin valleys as a common weed of rice fields. It has also been collected south of Napa.

#### KYLLINGA

*Kyllinga brevifolia* Rottb. is reported by Wiggins (1933) as collected in San Diego by L. W. Nuttall (July 21, 1932). It is from the American tropics.

### PONTEDERIACEAE

#### EICHORNIA

Water hyacinth, *Eichornia crassipes* Solms., a native of tropical America, known in the South as "million dollar weed," has spread so rapidly in the streams of certain Gulf states as to hamper navigation. Thus far it has become established in only a few California localities: near Clarksburg in Yolo County, along branches of the Kings River near Centerville, on Warner Creek in San Bernardino County; on the Los Angeles River, near Hynes, collected in 1904, and on the San Gabriel River, collected in 1907.

### LILIACEAE

#### ASPARAGUS

*Asparagus officinalis* L. (asparagus), a European field and garden plant, has occasionally escaped from cultivation about Alameda, San Bernardino, and Los Angeles.

#### ASPHODELUS

*Asphodelus fistulosus* L., a native of the Mediterranean region, is called by Parish (1920) "a waif, escaped from cultivation at a Mexican settlement, Bryn Mawr, near Redlands, in 1909."

### URTICACEAE

#### CANNABIS

*Cannabis sativa* L. (common hemp or marihuana), native to central and western Asia, has been found in many widely separated localities in California. Many plants are doubtless the result of artificial rather than natural seeding, for the sake of their narcotic properties. It was probably introduced into California by Mexicans.

#### HELXINE

*Helxine Soleirolii* Req., a Corsican species, has been reported recently from Pacific Grove as infesting lawns and gardens. It also occurs in greenhouses and lathhouses, often becoming objectionable.

**URTICA**

*Urtica urens* L. (small nettle) now occurs in the south coast ranges and along the coast of southern California. Torrey (1859) found it in 1859 in the streets of Monterey. Parish (1920) states that Brewer collected it at Ventura as early as 1861. It is an introduction from Europe.

**POLYGONACEAE****EMEX**

Two species of this genus have been found in California, *Emex spinosa* Campd. and *E. australis* Steinh. The former, according to Munz (1935), has been collected at Limoneira Ranch, Fillmore, Ventura County. E. Johnson, in correspondence, reports its occurrence at Villa Park, Orange County, as early as 1925. The seed was doubtless included as an impurity in imported fenugreek seed. It is an Old World species. Goodman (1932) states that he found in the Pomona College herbarium a specimen of *E. australis* collected by Marcus E. Jones at San Francisco in 1881. Greene (1891) collected it still earlier—"on a railway embankment at South Vallejo in 1874." Stacey (1933) collected it about 1915, at Benecia, Solano County. This species is chiefly South African.

**FAGOPYRUM**

*Fagopyrum esculentum* Moench. (buckwheat) is a native of Eurasia and, according to Parish (1920) was, in 1918, a roadside casual at La Verne, in Los Angeles County.

**LASTARRIAEA**

*Lastarriaea chilensis* Remy, regarded by Jepson (1909-36) as a naturalized species from Chile, occurs from Contra Costa and Monterey counties to southern California and thence north to Mono County.

**POLYGONUM**

According to Bellue (1934b), *Polygonum argyrocoleon* Steud. (silver-sheathed knotweed) appeared in 1921 in alfalfa seed produced in the Imperial Valley, probably having been introduced some twenty years earlier as an impurity in imported Turkestan alfalfa. Regarding its present status in California, she says:

Until 1933 we believed this new knotweed limited to south of the Tehachapi, most prevalent in and spreading from the Imperial Valley. . . . Seeds from southern California carrying this weed had been sold almost throughout the state, yet we were unable to learn of any instance where the plant had established itself northward. However, in October, 1933, Donald M. Smith, county agent of Tehama County, sub-



mitted a plant for identification. The specimen lacked the exuberant growth and prolific flower spikes exhibited by the southern California plants, but it was unmistakably the same species. . . . The Tehama County plant was taken from a small alfalfa field in the northern part of the county. . . . Since its presence was first noted in 1922, the consistent increase and spread of silver-sheathed knotweed are well brought out by examination of the seed lots submitted for purity tests from the Imperial Valley alfalfa-seed-producing section. In 1927 only 72 lots contained seed of this weed, with very few to the pound. In 1929 it was found in 79 lots. In 1931, 112 lots carried the impurity, in one instance at the rate of 9,180 knotweed seeds to one pound of alfalfa. In 1932 the records show 189 lots. In 1933 practically every lot of the 403 received from the southern section contained the knotweed seed. It has become a dependable earmark indicating the source of seed in which it occurs.

Ball (1936) reports an infestation near Stockton.

*Polygonum aviculare* L. (knotweed), an abundant and widely distributed European species, is regarded by Hendry and Bellue (1925) as a post-mission period introduction. Torrey (1856) cites it from the valley of Sacramento in 1838-42; Brewer and Watson (1876) as "very widely naturalized, growing about yards and roadsides, apparently not yet common in California."

*Polygonum Convolvulus* L. (black bindweed) occurs sparingly in California. Brewer and Watson (1876) call it "an introduced weed from Europe, to be expected in California." K. Brandegee (1892a) reported it as becoming common at San Francisco in 1891; it was collected at Pasadena in 1894; Jepson (1923-25) cites collections at Sisson, Fort Bidwell, Yosemite, and San Francisco. Specimens have been received from alfalfa fields near Riverside and from Honey Lake Valley.

*Polygonum exsertum* Small (long-fruited knotweed) has been collected just north of San Francisco Bay and in a salt marsh at Cutting Wharf on the Napa River. It is native in eastern United States. *P. lapathifolium* L. (pale smartweed) from Europe, is fairly widely distributed in California, Jepson (1909-36) citing it from Yreka, Howell Mountain, the lower Sacramento River, Ione, West Berkeley, Alvarado, the Los Buellis Hills in Santa Clara County, Bakersfield, Lone Pine, Los Angeles, Ramona, and Calexico. It has also been collected at Kenwood in Sonoma County. *P. pennsylvanicum* L. (Pennsylvania smartweed) is reported by Howell (1933a) just west of Kenwood, Sonoma County. It is native in eastern United States. *P. Persicaria* L. (lady's thumb), a native of Europe, reported by Brewer and Watson (1876) near Humboldt Bay, is now widely distributed in California. According to E. Johnson, in correspondence, *P. Sieboldii* DeVriese (Siebold's smartweed), native ornamental from Japan, is a consistent escape from gardens at Hueneme, Ventura County.

## RUMEX

Of the twelve species of *Rumex* in California, five are introduced from Europe: *R. crispus* L. (curly dock), *R. conglomeratus* Murr. (green dock), *R. pulcher* L. (fiddle dock), *R. obtusifolius* L. (bitter dock), and *R. Acetosella* L. (sheep sorrel).

Hendry and Bellue (1925), finding the seeds of *Rumex crispus* in the adobe bricks from the walls of old Spanish buildings, conclude that this species was introduced before 1769. Brewer and Watson (1876) list all the species mentioned above. Concerning *R. crispus* they say: "It has been collected at Oakland, Monterey, and elsewhere, and will doubtless become common"; concerning *R. conglomeratus*: "collected at various localities through the entire length of the state"; concerning *R. pulcher*: "a species of the Mediterranean region, sparingly introduced; Alameda County, Kellogg"; and concerning *R. Acetosella*: "a lively plant at Santa Cruz, both in irrigated lawns and in fields that are quite beyond the reach of water in summer. Single plants of it seen by me in 1883 on the narrow-gauge railroad, a third or half mile from the town station."

Hilgard (1890) reports *Rumex crispus*, *R. pulcher*, and *R. Acetosella* as common California weeds. Greene (1891), speaking of the San Francisco Bay region, states that all of the five species of *Rumex* given above except *R. obtusifolius* are common. The latter is rather sparingly naturalized and occurs in lowlands only; Parish (1920) does not mention it as occurring in southern California. *R. Acetosella* was collected at Pasadena in 1890, at Long Beach in 1891, in Honey Lake Valley in 1898; it was abundant at Santa Barbara in 1916, and common in yards and by roadsides at Claremont and Pomona in 1918. Parish (1920) described it as "apparently recently naturalized in the south, where it is increasingly frequent in the coastal region." According to him, *R. pulcher* was sparingly introduced at Inglewood, Los Angeles County, about 1904, "the only southern report." However, it was a common weed much earlier than this in northern California. *R. conglomeratus* was probably an early adventive.

## CHENOPODIACEAE

## ATRIPLEX

Abrams (1933), in 1932, collected *Atriplex hortensis* L. (garden orache) on the road between Redwood City and San Mateo. It is an Asiatic species. According to Standley (1916), *A. Lindleyi* Moq. (Lindley's orache), a native of Australia, is "adventive, or escaped from cultivation in San Diego County"; Munz (1935) cites it from near El Nido.

*A. rosea* L. (redscale) a native of Europe, has become naturalized in fields and waysides in widely separated localities in California. In 1902, it was collected at Ballona; in 1916, at Woodland; subsequently along the Los Angeles coast, in the Mojave Desert, and along the bayshore road of the Peninsula.

Eastwood (1901) wrote as follows of *Atriplex semibaccata* R.Br. (Australian saltbush):

This species of *Atriplex* has been introduced in California through the California Agricultural Experiment Station. Prof. E. W. Hilgard, the head of the Agricultural College, has for years been trying to find plants that could be used as forage plants and which could be cultivated in the alkaline lands of this state. Through the kindness of Dr. Fred. von Mueller, seeds of several species of *Atriplex* were received from Australia, of which this proved to be the best. It was particularly successful at the station at Tulare, and seeds raised there were distributed throughout California. There is a specimen in the herbarium of the California Academy of Sciences received from Mr. A. B. Leckenby, who was at that time attached to the Kern County Land Company's Experiment Station at Bakersfield, and who raised the plants from seed received from the Station at Tulare.

In August of the present year, the author found this plant growing on the edge of the salt marsh not far from Larkspur and apparently flourishing. How it came there is not known, but as it may eventually become widely spread along the marsh lands of Marin County, this first record of its appearance is of interest.

Parish (1920) observed Australian saltbush at San Bernardino in 1905; at San Diego in 1916 as "a most abundant weed"; in the Imperial Valley in 1913, "abundant in towns and along roads." Munz (1935) records it as occurring "commonly along the coast, San Miguel, San Clemente and Catalina Islands; sparingly inland at Upland, Rincon, Temecula, Imperial." In recent years many specimens have been sent in from Suisun Valley. It also occurs in the Salinas Valley.

#### BASSIA

*Bassia hyssopifolia* (Pall.) Kuntze (five-hook bassia), a native of the Caspian Sea region, has become established in a few localities in the western states. Munz (1935) reports it from the mouth of the Santa Ana River, in Orange County. Piemeisel and Lawson (1937) find it, with several other invaders, in the spiny saltbush and mixed lowland associations in the San Joaquin Valley on areas that have been cleared, cultivated, and then abandoned. It is now fairly abundant from Bishop to Lancaster in the Owens Valley, in the Santa Ana Valley, the Imperial Valley, the Coachella Valley and the Palo Verde Valley. In 1921 Kennedy (1927) collected it in the western San Joaquin Valley and reported it as "something new" to him. There is a specimen in the U. S. National Herbarium collected at Los Banos, Merced County, in 1921. Johnson

(1939) believes that it was probably introduced into this country from Argentina, since the federal seed laboratory reported its presence in 40 to 50 per cent of the alfalfa seed from that source. The plant is eaten by livestock and compares favorably with alfalfa as a forage.

### BETA

*Beta maritima* L. (wild beet) is referred to by Carsner (1928) as "an intruder whose objectionable characteristics make it an important weed in sugar-beet-growing areas." According to him it was discovered by J. B. Norton of the office of the County Agricultural Commissioner in Imperial County. Other infestations occur near Milpitas, Oxnard, Chino, Gardena, Compton, Willowbrook, Watts, Santa Ana, and Huntington Beach. These wild beets are apparently descendants of crosses between the ancestral wild beets and sugar beets. Possibly shipments of sugar-beet seed from Europe contained seed of wild beets or of wild-beet hybrids. *B. vulgaris* L. (beet) has escaped from cultivation in certain localities—Santa Barbara, Mesmer, San Bernardino, Corona, and elsewhere. It is a native of Eurasia.

### CHENOPODIUM

The introduced species of *Chenopodium* occurring in California are as follows: *C. album* L. (lamb's-quarters); *C. Botrys* L. (Jerusalem oak); *C. ambrosioides* L. (Mexican tea); *C. Murale* L. (nettle-leaf goosefoot); *C. carinatum* R. Br. (Australian goosefoot); *C. anthelminticum* L. (wormseed); *C. rubrum* L. (red goosefoot); and *C. vagans* Standley. *C. ambrosioides* and *C. anthelminticum* are introductions from tropical America, *C. vagans* from Chile, *C. carinatum* from Australia, and the remaining species from Europe.

Several species of *Chenopodium* were undoubtedly early representatives of our weed flora, as is attested by seeds found in the adobe bricks of old buildings by Hendry and Bellue (1925). *C. album* seeds were found in such bricks of La Soledad at Soledad, constructed in 1793–97, and in those of Rancho La Natividad near Salinas, 1837; seeds of *C. murale* in San Fernando Rey de Espana at San Fernando, constructed in 1797, and in San Juan Bautista at San Juan Bautista, founded in 1797; seeds of *C. Botrys* in San Jose de Guadalupe, Mission San Jose, established in 1797; and seeds of an unidentified *Chenopodium* species in Rancho El Sansal, Salinas, constructed in 1834.

Torrey (1856) collected *Chenopodium album* on the lower Sacramento in 1838–42. Brewer and Watson (1876) report several species of *Chenopodium*: *C. album*, "a common weed, introduced everywhere";



*C. murale*, "introduced; chiefly near the Coast, from San Francisco to San Diego"; *C. Botrys*, "sparingly introduced on the Pacific Coast"; and *C. ambrosioides*, "in salt marshes and waste places about San Francisco and southward to San Diego; Lake Tahoe, Lemmon." Torrey (1856) collected *C. ambrosioides* on the Salinas River before 1856. *C. carinatum* is recorded by Jepson (1909-36) from Humboldt County, east Shasta County, Oroville, West Branch in Butte County, Ione, Jackson, Upland, and Ontario. It was collected at Pasadena in 1906; at Upland and Ontario in 1918; also at Paradise and Greenville. *C. rubrum* is reported from the lower Sacramento River, Alvarado, from Nigger Slough and Ballona in Los Angeles County, from Elsinore, and Baldwin Lake. *C. vagans* is adventive along roadsides in San Joaquin and Sacramento counties.

#### ROUBIEVA

*Roubieva multifida* (L.) Moq. (cut-leaved goosefoot) is naturalized from South America. Brewer and Watson (1876) report it as very sparingly introduced in Plumas County. K. Brandegee (1891) calls it "abundant" at San Francisco. Jepson (1891) finds it naturalized at Vacaville and also in the San Francisco sandhills. It was collected at Compton in 1895, at Pasadena in 1904, at Riverside and Upland in 1906, and at Ontario in 1918.

#### SALSOLA

The weed pest, *Salsola Kali* L. var. *tenuifolia* G. F. W. Mey. (Russian thistle), was introduced into the United States in 1886 in flax seed from Russia sown near Scotland, South Dakota. It continued gradually to cover new territory and by 1888 had infested most of the counties between the Missouri and James rivers in South Dakota and Missouri. By 1895, it is reported that sixteen states and thirteen Canadian provinces had been infested; and in that year the Pacific Coast states were warned of the approaching danger. By the close of the decade (1884-1894) it had reached Oregon. Brewer and Watson (1876), Bolander (1870), Hilgard (1890), and Parish (1890-91) do not mention it in California.

A letter dated January 25, 1895, from L. A. Dewey, Botanist in the United States Department of Agriculture, and addressed to Professor E. W. Hilgard, then Director of the California Agricultural Experiment Station, referred to "two specimens of the Russian thistle from Lancaster, Los Angeles County, California. . . . It is said to be distributed over an area of about 10 miles long and 4 or 5 miles wide in the desert near Lancaster, and to be most abundant about the station of Lancaster where there is water."

Shinn (1895), having visited the Lancaster Valley in April, 1895,

reported later: "It first appeared in the streets of the town near the railroad track, several years ago, probably brought in by cattle cars, as there is very little immigration by wagon across that district." He further states: "There is a strong probability that the thistle has already been carried southward along the line of the railroad into San Fernando Valley, and the branch railroad from that point affords easy access to Ventura and Santa Barbara. . . . In fact, it has already crossed the Tehachapi range, and has made its appearance in Kern County." G. F. Weeks of Bakersfield wrote Mr. Shinn: "It is growing here, from seed evidently scattered from cars that have come through Nebraska or some other infested section, as at present it is only found along the railroad tracks." Shinn, however, seems to think that it may have reached Kern County by way of the Tejon Pass.

Davidson (1895*a*) reports, among other weed plants, the Russian thistle, introduced into the Antelope Valley about 1891:

There is no doubt of its existence now over a considerable area of the desert lands. It grows freely in the streets of Lancaster, or in any ground where the surface is occasionally disturbed and is thus more likely to prove a pest in cultivated fields than in orchards or in open ground. . . . Ten miles to the southwest it is also well established, and the local authorities, by way of exterminating the pest, have destroyed all of the old and already fruited plants, and have left those of this season's growth to mature at will.

Eastwood (1896*b*) reports finding in June, 1895, a single Russian thistle plant "along the railroad track between Lathrop and the San Joaquin bridge." She further wisely remarks, "It is to be expected along our railroads and ought to be destroyed."

In the Dudley Herbarium at Stanford University the three earliest collections of Russian thistle are as follows: (1) Vicinity of San Bernardino, August 15, 1901, collected by Parish, who wrote on the sheet "first appearance"; (2) Cajon Pass, August, 1901, collected by Abrams; and (3) Pajaro River, Watsonville, September, 1909, collected by W. R. Dudley.

Davy (1902), discussing the stock ranges of northwestern California, says nothing about Russian thistle. Parish (1913) found none in the Imperial Valley.

Today this weed is abundant in southern California, throughout portions of the Sacramento Valley, and on the Carisa Plain in San Luis Obispo County; it occurs also locally at Alturas and at Long Valley in Lassen County. Piemeisel and Lawson (1937) emphasize its importance in the San Joaquin Valley. It is among the principal species that have come in on fallow lands and neglected farm lands in the "tree savanna,"

the overgrazed areas of the Pacific grassland, and the abandoned farm lands of the desert saltbush. It is, however, of no importance on the cultivated or overgrazed lands of the spiny saltbush association or the associations of the "lowland types." On early spring ranges it is rated as fair forage for all classes of livestock.

## AMARANTHACEAE

### ACHYRANTHES

A native of Mexico, *Achyranthes repens* L. was collected at Los Angeles in 1884, in the same locality in 1892, at Oceanside in 1925, and at Santa Paula in 1928.

### AMARANTHUS

Of the nine species of amaranths occurring in California, five are introductions: *Amaranthus retroflexus* L. (rough pigweed) *A. hybridus* L. (green amaranth), *A. graecizans* L. (tumbling pigweed), *A. blitoides* Wats. (prostrate pigweed), and *A. deflexus* L. (low amaranth). The first three mentioned are introduced from tropical America; *A. blitoides* is introduced in California, probably from adjoining states, being native to the drier regions of western North America; and *A. deflexus* is naturalized from Europe.

According to Hendry and Bellue (1925), *Amaranthus retroflexus* was introduced before or during the Mission Period (1769–1824). Brewer and Watson (1876) record the occurrence of *A. retroflexus*, *A. blitoides*, and *A. graecizans*; regarding the last they are erroneous in stating "it is doubtless indigenous." Apparently *A. retroflexus* was the first amaranth to invade California, and today it is the most widely spread and abundant of all. *A. graecizans*, well established by the sixties, is today also very widespread. Hilgard (1890) cites both *A. retroflexus* and *A. graecizans*. Other early records for *A. graecizans* are as follows: San Jacinto Mountains, 1901; Mojave Desert, Panamint Mountains, 1891; summit of Mount Hamilton, 1893; lower Sacramento Valley, 1893; Victorville and Mecca, 1913. *A. blitoides*, also probably well established in the early sixties, was collected at Santa Monica in 1892, at Lancaster in 1897, and at Ontario in 1918. Other localities are San Jacinto, La Jolla, Upland, Claremont, El Monte, Adelanto, Palm Springs, Rialto, Suisun, Niles, Yreka, and Modoc County. Today it is less abundant in California than either *A. retroflexus* or *A. graecizans*. The first record of *A. deflexus* in the state is that of Eastwood (1898), San Francisco. According to Parish (1920) it was noted, in 1902, at Los Angeles; in 1916, as "abundantly naturalized in the streets of Santa Barbara and adventive farther south"; in 1917, at Ontario; and at Pomona in 1918. According to Parish

(1920) it was "an abundant street weed in the Monterey and San Francisco regions, whence it probably reached the south." Today it is a common street weed in Sacramento. Parish (1913) lists *A. hybridus* and *A. graecizans* as among the weeds apparently not present in 1913 in the Imperial Valley.

## PHYTOLACCACEAE

### PHYTOLACCA

*Phytolacca decandra* L. (pokeweed), a native of the eastern United States, is reported by Parish (1890-91) near Santa Monica. T. Brandegee (1893) states that the species "recently recorded from Los Angeles County, was observed by Frank H. Vaslit on Cow Mountain, in the northern part of Lake County, in 1885. It is very abundant along the California and Oregon Railway in the Siskiyou Mountains; Blue Lakes, Lake County, . . ." Jepson (1923-25) reports it as occurring from Blue Lakes to Ukiah. It has also been collected at Chula Vista.

## AIZOACEAE

### CYPSELEA

*Cypselea humifusa* Turp., an immigrant from the West Indies, is rare in California, having been found thus far in lowlands along the lower San Joaquin River and at Aptos in Santa Cruz County.

### GLINUS

*Glinus lotoides* Loebl., the only species of this genus occurring in California, was introduced from Europe and thus far has become established at Lathrop, Chico, and Lakeport.

## MESEMBRYANTHEMUM

Several species of *Mesembryanthemum* occur in California, and there has been some question as to whether certain of them are indigenous or introduced. By some, *M. nodiflorum* L., *M. crystallinum* L. (ice plant), and *M. aequilaterale* Haw. (sea-fig) are regarded as indigenous; and Jepson (1909-36) so treats them in *A Flora of California*. Munz (1935), on the other hand, regards the first two of these as naturalized. *M. cordifolium* L. (dew plant), *M. pugioniforme* L., and *M. edule* L. (Hottentot-fig) are regarded as introductions without question. *M. cordifolium*, a native of South Africa, cultivated in California for more than 45 years, has sometimes escaped from cultivation. K. Brandegee (1891) reports it from San Francisco. It is also naturalized about La Jolla and San Diego. *M. pugioniforme*, a more recent introduction, is found in only a few localities, namely on the Cliff House sand dunes at San Fran-



cisco, and at Pacific Grove. *M. edule*, a native of South Africa, planted as a sand binder, has occasionally escaped along the southern coast. An early collection was at Playa del Rey in 1918.

#### MOLLUGO

*Mollugo verticillata* L. (carpet-weed) from the Old World tropics, entered California by way of Mexico. Torrey (1856), from 1838 to 1842, collected it along the upper Sacramento River; Brewer and Watson (1876) in Eagle Creek Canyon, Modoc County, in 1862. It is also recorded from Stillwater, Shasta County, and from Princeton, Healdsburg, Russian River, Visalia, Los Angeles, Laguna Beach, Anderson, and Beaumont. It was introduced into the Delta region many years ago, but apparently is not spreading there. *M. Cerviana* (L.) Ser., a native of the Old World, was collected in 1929 from the Thomas Valley in the San Jacinto Mountains.

#### TETRAGONIA

*Tetragonia expansa* Murr. (New Zealand spinach), a native of Australia, is cultivated to some extent in California as summer "greens." It has become sparingly established on seabeaches. Greene (1891) reports it from Marin and Alameda counties; K. Brandegee (1891) from South San Francisco and Fort Point. Other localities are Pacific Grove, Canada del Refugio, Santa Barbara, Monterey, Imperial Beach, Ocean-side, Laguna, Hermosa Beach, Carlsbad, and Del Mar.

### PORTULACACEAE

#### PORTULACA

A well-known weed in Europe, whence it was introduced into the United States, is *Portulaca oleracea* L. (purslane). It is widespread in California, whither it was probably brought during the pioneer period. According to Brewer and Watson (1876) it was naturalized as a weed in gardens and cultivated grounds.

### CARYOPHYLLACEAE

#### AGROSTEMMA

*Agrostemma Githago* L. (corn cockle), a weed of European origin, is occasionally found in grain fields in the Sacramento and San Joaquin valleys and in the valleys of the Coast Range. It was reported from Berkeley in 1891. Other collections have been made at College City in 1906, Liveoak, and St. Helena in 1908, and San Bernardino in 1912.

#### ARENARIA

*Arenaria serpyllifolia* L. (sandwort), a native of Europe, is rare in California. It has been reported in lawns at Claremont in 1918, at Colby's

Ranch, the San Gabriel Mountains, and in stream beds in Humboldt County (Willow Creek, Trinity River, and Klamath River).

#### CERASTIUM

The common weed of fields and roadsides, *Cerastium viscosum* L. (annual mouse-ear chickweed), is naturalized from Europe. Brewer and Watson (1876) record it from Auburn, Placer County. It was collected in 1884 at San Diego, in 1893 at Santa Monica and Los Angeles, and in 1898 at Witch Creek and Temecula. *C. vulgatum* L. (perennial mouse-ear chickweed), also from Europe, is a common weed of lawns throughout the state. Brewer and Watson (1876) report it from Plumas County.

#### HERNIARIA

*Herniaria cinerea* DC. is sparingly naturalized in the foothills on either side of the lower San Joaquin Valley and in a few localities in southern California. It has been collected at Oakdale in 1896, Wawona in 1897, Escalon in 1905, Stockton and Tracy in 1907, and also San Diego and Claremont. It is a native of Europe.

#### PARONYCHIA

An introduction from Chile, *Paronychia franciscana* Eastw. (whitlow-wort) is now found from San Francisco to Sonoma County. K. Brandegee (1891) reports it as abundant in the western part of San Francisco from the Presidio at least as far as the southern end of Lake Merced. The earliest herbarium specimen is labeled in the handwriting of the first observer: "Presidio, San Francisco, April 21, 1887; E. L. Greene."

#### POLYCARPON

*Polycarpon tetraphyllum* L. (four-leaved all-seed), a native of Europe, has a very limited distribution in California. It grows in beaten gravelly places and in the crevices of brick walks. Jepson (1909-36) records it from Vallejo in 1892, St. Helena in 1897, and Berkeley in 1903; Munz (1935), from Santa Barbara. It is also found in lawns in Alhambra.

#### SAGINA

*Sagina apetala* Ard. (dwarf pearlwort), naturalized from Europe, has been collected at Jackson in 1892, in Tehama County in 1899, and at Pasadena in 1917.

#### SAPONARIA

*Saponaria officinalis* L. (bouncing bet) is a garden plant sparingly naturalized from Europe. According to Jepson (1909-36), it is "spontaneous on sandbars of the Sacramento River below Delta."

**SCLERANTHUS**

*Scleranthus annuus* L. (knewel) is sparingly naturalized from Europe. It has been collected near Placerville and at Pala.

**SILENE**

*Silene gallica* L. (windmill pink) was early established and is now a common weed at low altitudes. It is of European origin. Seeds of an unidentified *Silene* species—probably *S. gallica*—were found in the adobe bricks of Rancho La Natividad, Salinas, laid in 1837. Specimens were among the Russian collection made in Sonoma County from 1840 to 1841 (Howell, 1937*c*). Brewer and Watson (1876) report it from many localities near the coast; Bolander (1870), from near San Francisco; Davy (1898*b*), from Calaveras County.

*Silene latifolia* (Mill.) Britten & Rendle (bladder campion) is a Eurasian species; it is reported by Munz (1935) from Anaheim. E. Johnson, in correspondence, reports in 1937 that in this locality the species is adventive in an orange grove and persists under cultivation. Near Santa Rosa it is scattered over about five acres, where it has occurred for approximately six years. It also occurs in San Francisco and at Sisson in Siskiyou County. *S. noctiflora* L. (night-blooming catchfly), a native of Europe, was collected in 1908 in lawns at Alhambra. *S. antirrhina* L. (sleepy catchfly), a native of the Old World, is becoming fairly common throughout California.

**SPERGULA**

*Spergula arvensis* L. (corn spurry), an introduced European weed, has become naturalized chiefly in fields and orchards near the coast. Brewer and Watson (1876) record it from Mt. Diablo in 1862; Bolander (1870), near San Francisco. Other early collections were made at Berkeley in 1886; Pasadena, 1892; San Diego, 1901; Monterey, 1908; Ione, 1904; Eureka, 1909; and Santa Barbara, 1916. Specimens have also been taken at Farmington in the San Joaquin Valley.

**SPERGULARIA**

*Spergularia rubra* J. & C. Presl. var. *perennans* Rob. (sand spurry), also from Europe, is gradually spreading, having been collected at Eureka, Shasta Springs, Redding, Bear Valley in Nevada County, Denver-ton, upper Napa Valley, Mt. Eden, Upland, Claremont, Pasadena, and San Diego County.

**STELLARIA**

*Stellaria media* (L.) Cyrill (common chickweed), from Europe, has become common in gardens, cultivated fields, vineyards and orchards,

shady lawns, shrubbery, fencerows, and ditches. Occasionally it occurs on the range, where it is considered fairly good forage for cattle and sheep. Bolander (1870) records it near San Francisco, while Brewer and Watson (1876) call it "common." *S. graminea* L. (grassy starwort), a native of Eurasia, found by Munz (1935) in lawns at Claremont, La Verne, and San Gabriel, is also reported from Lodi.

#### TUNICA

*Tunica prolifera* (L.) Scop., an Old World species, was collected in May, 1933, northeast of the Spencerville Road at Indian Springs.

#### VACCARIA

*Vaccaria vulgaris* Host. (cow cockle) is chiefly a grain-field weed, and a native of Europe. Brewer and Watson (1876) record it from Butte County. It was collected at San Diego in 1884, near San Bernardino and in Plumas County in 1891, at Berkeley and Dulzura in 1898, College City in 1906, Sierra Madre in 1908 at 4,000 feet altitude. Parish (1920) observed a single plant near Baxter in the Mojave Desert in 1915.

#### VELEZIA

*Velezia rigida* L. is an introduced species from the Mediterranean region now locally established on dry foothills at La Grange in Stanislaus County and in the Hupa Valley of Humboldt County.

### RANUNCULACEAE

#### RANUNCULUS

In California there are four adventive European species of *Ranunculus* growing without cultivation. *Ranunculus muricatus* L. (spiny-fruited crowfoot) is scattered widely in northern and central California, being cited by Jepson (1909-36) from Eureka, Hamilton City, Sonoma Valley, Angel Island, San Francisco, Donner Canyon on Mt. Diablo, Milpitas, Saratoga, Knight's Ferry, Quartz in Tuolumne County, and New York Ravine in El Dorado County. We have specimens from Redding and Auburn.

*Ranunculus repens* L. (creeping buttercup) is sparingly naturalized in marshes along the north coast. Jepson (1909-36) records it from Berkeley, Bear Valley in Marin County, and Humboldt Bay; Keck (1933) finds it well established in a meadow at Quincy. *R. arvensis* L. (corn crowfoot) has been collected from Mt. Bullion in Mariposa County. *R. bulbosus* L. (bulbous buttercup) has thus far been found only as an escape at Fortuna in Humboldt County.



## PAPAVERACEAE

## GLAUCIUM

*Glaucium flavum* Crantz (yellow sea poppy) is a European species reported by Munz (1935) as naturalized at Elsinore.

## FUMARIACEAE

## FUMARIA

*Fumaria officinalis* L. (fumitory), a native of Europe, has become established in some orchards at Ontario, Upland, Banning, and San Luis Obispo and in sugar-beet fields at Woodland. Early collections were made at San Luis Obispo in 1909, at Ontario and Upland in 1917.

## CAPPARIDACEAE

## WIZLIZENIA

*Wizlizenia refracta* Engelm. (jackass clover), although a native of southeastern California eastward to New Mexico, has spread northward and become abundant in the San Joaquin Valley. Greene (1891) reports it as "common at Lathrop and near Sacramento; also at the south." Pie-meisel and Lawson (1937) find it as one of the dominants on the overgrazed areas and abandoned farms of the "lowland types" of vegetation in the San Joaquin Valley. Jepson (1909-36) states:

In the San Joaquin Valley, *Wislizenia refracta* . . . was probably introduced during the early decades of the American occupation, since it had been noted as occurring there for a long period. A. L. Winchel, a local historical authority in Fresno, remembers the plant as growing in Fresno County on the west side of the San Joaquin River previous to 1870. Others recall the plant in that district for thirty years past. H. W. Shafer, an engineer of Selma, first observed the plant on Poso Creek east of Formosa in 1886, and also near Traver; he believes it to be an immigrant. From Goshen it was sent to us in 1900. In 1928 we noted it along the railway lines in Tulare County and observed its behavior on the alkali plains west of Fresno where it is very common. As observed north of Kerman, the plant seemed as if it had the habit of appearing initially along the roadways, thence spreading into the fields, especially moist ones broken by the plow. On the Fresno-Mendota road it continued . . . on the plain as far west as the road station called Lone Willows. . . This species is undoubtedly an introduction into the Great Valley from the southwards. In 1901 it was thought to be more common in the lower San Joaquin Valley than it had been formerly. It was not collected by Brewer, Bolander, or any of the other early day collectors in the San Joaquin Valley. So conspicuous a plant could not well have been missed.

## CRUCIFERAE

## ALYSSUM

*Alyssum alyssoides* L. (small alyssum), a European garden plant, has become naturalized in Siskiyou County. According to Jepson (1909-36)

it was at one time adventive in the San Francisco Bay region. *A. maritimum* Lam. (sweet alyssum), also a European garden plant, is a common escape in the coastal region from San Diego to San Francisco.

### BRASSICA

*Brassica alba* Boiss. (white mustard), a naturalized European weed, is much less common than the following. Bolander (1870) records it near San Francisco, the earliest collection in the state. Parish (1890–91) lists it from southern California counties.

*Brassica arvensis* (L.) B.S.P. (wild mustard), also a native of Europe, was apparently introduced later than either *B. campestris* or *B. nigra*. Munz (1935) reports it as an "occasional weed, Claremont, Upland, Moreno, Beaumont, Coachella, etc."; and Jepson (1909–36) cites it from Eureka, Napa, Vacaville, Berkeley, San Francisco, and Alviso. As Piemeisel and Lawson (1937) point out, it ranks among the principal species on fallow lands and neglected farm lands of the tree savanna and abandoned farm lands of the San Joaquin Valley. In the Sacramento Valley it is a common grain-field weed.

*Brassica campestris* L. (common yellow mustard), naturalized from Europe, has become very abundant. Brewer and Watson (1876) cite it as much less troublesome than *B. nigra*, but rather common in fields near San Francisco Bay and occasionally met with elsewhere. Parish (1890–91) speaks of it mainly as a wayside weed, somewhat less common than *B. nigra* in Los Angeles County, but "in my neighborhood increasing of late years." Since the nineties it has spread rather rapidly in orchards, fields, and waste places, till today it may be listed among the common mustards of our state, one of the principal species of *Brassica* that has come in on fallow lands and neglected farm lands of the tree savanna and Pacific grassland of the San Joaquin Valley.

*Brassica incana* Meigen. (short-podded mustard) is also an introduction from Europe. The earliest collection in California was by Parish (1920) in 1895 at San Bernardino. Other early collections were Los Angeles in 1909, San Bernardino in 1914, and Redlands in 1918. About 1915 it was first observed at Berkeley. Other localities are St. Helena, Oakdale, and the lower Sacramento River. Munz (1935) reports it as "becoming common as a weed in waste places." Jepson (1909–36), comparing it with *B. nigra* and *B. campestris*, notes that it "spreads freely over dry, unbroken ground and flourishes chiefly during the arid summer season," so that it is "evidently destined to be the more abundant species and is already a serious agricultural pest." Gander (1937) has collected it at several stations in San Diego County. Ball (1936) reports:

"dense, vigorous stands were noted in fields bordering the highway in the northern part of the state, and numerous plants for identification were received from the south with reports of increasing prevalence."

*Brassica juncea* (L.) Cosson. (Indian mustard), a native of Asia, is reported by Munz (1935) from the San Bernardino Valley, has been collected near Santa Barbara, and according to Ball (1936) is abundantly established in the grain fields of the Tule Lake region, Siskiyou County.

*Brassica Napus* L. (rape), a rare, naturalized plant from Europe, is reported by Munz (1935) as an "orchard weed between Ontario and Pomona."

*Brassica nigra* Koch (black mustard) was apparently the first alien *Brassica* to become established in California. Hendry and Bellue (1925) have definite evidence of its occurrence during the Mission Period. According to Jepson (1909-36): "Folk legends have come down which picture the friars dropping the seed at intervals on the flats and in the passes, while threading the unknown coastal valleys . . . northwards towards the later San Francisco, in order that the expedition might, by the growing plants, easily find its way back again . . . the next year." Brewer and Watson (1876) call it "a troublesome weed and difficult to eradicate, covering large areas, particularly in the more fertile valleys of the southern half of the state, sometimes forming a dense growth." Evidently, black mustard was established in the more settled parts of California by 1850, as is attested by early pioneers. Parish (1890) says of Los Angeles County, "Hardly a grain field is entirely free from *B. nigra*, and on the rich adobe lands it is exceedingly luxuriant and abundant, in places taking entire possession of the soil and overtopping horse and rider." Jepson (1909-36) emphasizes the abundance of *B. nigra* in an early period:

In pioneer days *B. nigra* was generally of ranker growth than at present, forming thickets 8 to 12 feet high which became, except for cattle paths, as impenetrable as brushwood. In the early eighties of the last century such thickets existed for many leagues all about the settlement of mainly adobe houses known as Los Angeles. Children were warned not to wander into the black mustard "groves," since they frequently became lost. Birds nested in the branches of these "trees" and, eating the seeds, disseminated widely the mustard pest.

Today *Brassica nigra* is widely spread at low altitudes throughout the state, except in the deserts, and particularly abounds in grain fields of the interior valleys. Piemeisel and Lawson (1937) mention it as a principal species on fallow lands and neglected farm lands of the tree savanna of the San Joaquin Valley.

### CAMELINA

*Camelina sativa* Crantz (large-seeded false flax) is an Old World species occasionally found in California. Greene (1891) says, "Not well established in California at least in our part, but found in a field at Berkeley by Mr. Chestnut in 1887." K. Brandegee (1891) reports it as abundant in fields and by the wayside near the Klamath River in Siskiyou County. According to Parish (1920), it was collected by McClatchie in a grain field at Redondo in 1897, "the only southern record." Munz (1935) cites it from Redondo and the Little Bernardino Mountains. *C. microcarpa* Andr. (small-seeded false flax), a native of Europe, is reported by Munz (1935) from Swartout Valley.

### CAPSELLA

*Capsella Bursa-pastoris* (L.) Medic. (shepherd's purse), an Old World weed, is abundant throughout California, up to 6,000 feet elevation, in orchards, vineyards, pastures, and waste places. According to Piemeisel and Lawson (1937), it is common in overgrazed areas of the tree savanna and Pacific grassland of the San Joaquin Valley, and also in all abandoned farm lands of that valley. Undoubtedly it was introduced very early.

### CONRINGIA

*Conringia orientalis* (L.) Dum. (hare's ear mustard) first appeared in California in 1918 as a waif at Upland in the San Bernardino Valley. It is native to the east Mediterranean region. *C. perfoliata* Link., also from Europe, is reported by Stacey (1933) as a waif at Santa Rosa.

### CORONOPUS

*Coronopus didymus* Smith (wart cress), from South America, has been collected as a weed at San Bernardino, Pasadena, Los Angeles, San Diego, San Francisco, Berkeley, Montezuma Hills in Solano County, Drytown in Amador County, Healdsburg, Dyerville, Hydesville, Holland Land Tract, and Manning Creek on the lower Van Duzen River. It is common about Sacramento. Jepson (1893) reports it as "established in the grain fields of the Montezuma Hills near Birds Landing." *C. procumbens* Gilib. (swine cress), a native of Europe, is adventive at San Francisco.

### DIPLLOTAXIS

*Diplotaxis tenuifolia* DC. (wall rocket), a European species, has become established in the coastal region of southern California. An early collection was from Los Angeles in 1895; a few years later, specimens were



taken at Pasadena. In 1929 E. Johnson reports, in correspondence, that it is "scattered over about 200 acres between Santa Ana and Tustin, introduced about ten years since." *D. muralis* (L.) DC. (sand rocket), also a native of Europe, is adventive at San Bernardino, where Parish (1920) reports it in 1914 as well established.

#### DRABA

*Draba verna* L. (shad-flower), an introduction from Europe, is reported by Jepson (1909-36) from Kelseyville, Potter Valley, Mendocino County, Carlotta on the Van Duzen River, Shasta River hills in Siskiyou County, and Yreka.

#### ERUCA

Regarding the history of *Eruca sativa* Mill. (garden rocket) in California, Bellue (1936a) writes as follows:

During the past three years we have had an increasing number of specimens of a certain mustard-like plant submitted for identification. Practically always it comes from flax-producing sections. The weed is garden rocket, sometimes called rocket salad. So closely does this plant resemble the common mustards... that it has become well established in some localities before its identity was recognized. Garden rocket is a native of Eurasia, and is a common impurity in commercial seed from that region. The general opinion is that this weed is a newcomer to California. This is not the case, as the plant is listed by Kennedy in 1917 as introduced in alfalfa fields in San Luis Obispo County. With the recent rapid growth of the flax industry, much seed flax carrying this impurity has been imported from India and China. Thus, during the past three years, garden rocket has assumed a new importance here. The weed has taken a strong hold in the flax fields in Imperial Valley, whole stands in that region being yellowed by its bloom. This year several hundred acres in the Merced region are heavily infested. Hand-pulling... had to be given up owing to the excessive labor cost.

Munz (1935) reports it as "rare, in waste places, San Bernardino." Jepson (1909-36) cites it near Yreka, from newly seeded alfalfa fields in San Luis Obispo County in 1909, and from San Bernardino in 1923.

#### ERYSIMUM

*Erysimum cheiranthoides* L. (wormseed mustard) is found thus far only along railroads in Placer County. *E. rapandum* L. (treacle mustard) has become troublesome in alfalfa fields in Modoc County, thus far the only known locality in California. Because of its tumbling habit, it is sometimes erroneously called Russian thistle. Like *E. cheiranthoides* L., it is of European origin.

#### HYMENOPHYSA

*Hymenophyssa pubescens* C. A. Mey. (hoary cress) is a native of the Altai Region of Central Asia. It was first collected in Los Angeles in

1910. According to Bellue (1933a), "during 1932 and 1933 we have observed it in the field throughout the state and it is frequently submitted for identification from scattered infestations." Munz (1935) cites it from Wintersburg in Orange County. E. Johnson writes that he has records of its occurrence at Westminster, Orange County; Walnut Park, Los Angeles County; and Camarillo, Ventura County.

#### IONOPSIDIUM

*Ionopsidium acaule* (Desf.) Reichb., a native of Portugal, is adventive at Ferndale in Humboldt County.

#### ISATIS

*Isatis tinctoria* L. (dyer's woad) has become established in Siskiyou County; in Scott Valley, particularly, it is troublesome in grain fields. It is spreading north and south of Siskiyou County, in the coastal counties, its migration aided by shipments of grain. It is adventive from Europe.

#### LEPIDIUM

*Lepidium Draba* L. (hoary cress), an adventive from Europe, is rapidly becoming one of our most pernicious perennial weeds. Brewer and Watson (1876) report it "near Yreka in a field long uncultivated." Jepson (1893) collected it as an occasional at Oak Knoll in the Napa Valley. Since the early 1890's it has spread rapidly, collections having been made at Menlo Park, Chino, Huntington Beach, Pomona, Santa Ana, and Watsonville; in Siskiyou County, near Gilroy, on the Bolsa towards Hollister, in the region of Paicines, about Los Banos, near Firebaugh, and near San Gregorio. In the last eight years it has become increasingly abundant in the San Joaquin and Sacramento valleys and in San Luis Obispo County. It has also been collected at Mission Valley in San Diego County, and E. Johnson, in correspondence, reports it from Oceanside, Lemon Grove, and San Ysidro in this county. He also has record of its presence at Westminster, Wintersburg, Smeltzer, Tustin, and Buena Park in Orange County, at Chino in Riverside County, at Big Bear Lakes in San Bernardino County, at numerous localities in Los Angeles County and Ventura County, and at Lompoc, Solvang, and Guadalupe in Santa Barbara County.

*Lepidium Draba* L. var. *repens* Thell. (hoary cress), a native of Afghanistan, has been recorded in the last few years at numerous widely scattered stations in California. An early collection was at Chino in 1918.

*Lepidium pubescens* Desv. (wayside peppergrass), regarded as an

introduction from Chile, is widespread in the coast ranges, from Humboldt County to San Luis Obispo County, in the Sierra Nevada foothills, in the northern Sacramento Valley, and southward to the northern borders of the San Joaquin Valley. According to Jepson (1909-36), "the earliest collections known to us are as follows: San Francisco, Vasey in 1875; Hupa Valley, Rattan in 1878; liveoaks of the Mokelumne River, Rattan in 1878; Petaluma, Congdon in 1880. It does not appear to occur in southern California even at the present day."

*Lepidium perfoliatum* L. (shield cress) is introduced from Europe. Though seldom abundant in California, it has a wide distribution, having been collected at Hollywood in 1910, Orange and Point Loma in 1913, Antelope Valley in 1917, and at later dates at Redman in western Mojave Desert, Firebaugh in Fresno County, Hollister, Summit Rock in the Santa Cruz Mountains, Sonoma, Truckee River at Lake Tahoe, and Yreka.

*Lepidium campestre* R.Br. (poor-man's pepper) European in origin, has been collected at Deer Park Inn, in Placer County, and at Donner Lake.

*Lepidium ruderales* L. (roadside peppergrass) is reported by Munz from Smeltzer, Orange County. It is naturalized from Europe.

*Lepidium latifolium* L. (slender perennial peppergrass) is a European species well established in parts of Mexico, and along the New England Coast. Recently it was reported from Montana. Within the last few years, it has made its appearance in Stanislaus County, about one mile from Oakdale, and also in San Joaquin County.

#### LUNARIA

Howell (1933a) cites the European moonwort, *Lunaria annua* L., as a garden escape on moist, shaded slopes of the Point Reyes Peninsula near Inverness in Marin County.

#### MATTHIOLA

*Matthiola incana* (L.) R.Br. (garden stock), a European species, is recorded by Parish (1920) as an escape along the bluffs at Laguna Beach in 1916. It is now known from scattered localities in the state.

#### RADICULA

*Radicula austriaca* (Crantz) Small (Austrian field cress), a European weed, has become exceedingly troublesome in the hay meadows south of Alturas in Modoc County. Although first reported there in 1933, it was undoubtedly introduced some years prior. A pernicious perennial, it should be vigorously stamped out.

### RAPHANUS

*Raphanus Raphanistrum* L. (jointed wild radish) is a European introduction, which was noted by Bolander (1870) near San Francisco. Collections were made at San Diego in 1891, Los Angeles in 1902, Pacific Grove in 1917; also at Berkeley, Elk Grove, and Yosemite. It is often abundant in grain fields on the east side of the San Joaquin Valley.

*Raphanus sativus* L. (wild radish), a naturalized European weed, widespread and abundant, is especially troublesome in grain fields of the San Joaquin and Sacramento valleys. It appears in the collection of the Russian-American colony made in Sonoma County in 1840–41 (Howell, 1937c); and according to Brewer and Watson (1876) was common in fields in various parts of the state. Accordingly, it is an early introduction, at least to northern California. Parish (1920) states that it was infrequent at San Bernardino as late as 1896.

### RAPISTRUM

Howell (1935a) cites the collection of *Rapistrum rugosum* (L.) All., from Europe, "as a sidewalk weed" on Lower Terrace, San Francisco, in the summer of 1930.

### SISYMBRIUM

The introduced species of *Sisymbrium* are all European in origin. *S. altissimum* L. (tumbling mustard) is generally distributed at elevations below 5,000 feet. Parish (1920) records collections at several locations in southern California between 1910 and 1918. It is now established in the Tule Lake area grain fields.

*Sisymbrium Irio* L. (London rocket) is cited by Parish (1920) as well established in some orange orchards at Upland by 1918. Munz (1935) reports it as becoming common, in orchards and elsewhere, in Los Angeles to Riverside counties. It has also been observed at several localities in San Diego County. Hoover (1935) collected it along a railway at Modesto; and Ball (1937) reports a vigorous infestation in Glenn County.

*Sisymbrium officinale* (L.) Scop. (hedge mustard) is occasional throughout California. According to Parish (1920), it is "a common weed of roadsides and waste places; ascending the San Bernardino and San Antonio Mountains to 5,000 feet altitude. It first appeared at San Bernardino about 1885." Bolander (1870) records it from San Francisco; Davy (1898b) from Calaveras County; Gander from numerous localities in San Diego County.

*Sisymbrium Sophia* L. (flixweed) is mainly introduced in Siskiyou



and Modoc counties. Howell (1933b) collected it "on the sandy open of the Mojave Desert, eleven miles south of Mojave, Kern County. . . . This seems to be the first record of the plant in southern California." It is reported by Jepson (1909-36) from Truckee; Warner Mountains, 1925; Alturas, 1910; Yreka, 1908; and Monolith in the Tehachapi Valley, 1927; and by Munz (1935) from Darwin in Inyo County. It was collected in the Antelope Valley in 1928. Ball (1937) found it well established in southwestern Tehama County; and Keck (1933) reports it at Quincy.

*Sisymbrium Thalianum* J. Gay. (thale cress), from Europe, occurs in open ground in Alameda, Lake, and Trinity counties. Jepson (1909-36) collected it in 1892, finding it from Knoxville Grade to Lower Lake. In 1917 it was observed spreading over the University of California botanical gardens as a weed; and elsewhere about Berkeley it occurs in protected places. In 1927, collections were made at Oregon Gulch Mountain in Trinity County.

#### THLASPI

*Thlaspi arvense* L. (penny cress) is a European weed found at Pasadena, Henniger Flats in the San Gabriel Mountains in 1918, Adin, Tule Lake, Alturas, and San Diego. In the middle western states it is a weed of importance, although not so thus far in California.

#### ROSACEAE

##### ALCHEMILLA

*Alchemilla arvensis* (L.) Scop. (lady's mantle), a species from Europe, is common on low hills and plains throughout California.

##### DUCHESNEA

*Duchesnea indica* Focke. (Indian strawberry) is a native of south Asia. In April, 1939, specimens were sent from Richardson Springs with a note that the plant was very abundant in the hills near that resort. As far as is known, this is the first record from California.

##### ROSA

*Rosa rubiginosa* L. (sweetbriar), a native of Europe, has become naturalized in Humboldt and Siskiyou counties, where it is found chiefly along roadsides.

##### SANGUISORBA

*Sanguisorba minor* Scop. (garden burnet), a native of Europe, has been found on Thompson Creek near La Verne in Los Angeles County.

## LEGUMINOSAE

## ALHAGI

*Alhagi camelorum* Fisch. (camel thorn). This most unusual legume became established in twelve counties of California early in this century. It grows wild throughout the date-producing sections of North Africa, in Turkestan, and also in European Russia, particularly in the highlands along the Volga. In its native land it is grazed and used for forage.

Camel thorn probably gained entrance into California in two ways: in early shipments of Turkestan alfalfa seed and in the packing around date offshoots. The former is undoubtedly the chief source. Much of the alfalfa planted in the San Joaquin Valley was Turkestan, the seed of which was imported. The plant does not spread rapidly by seed, probably because the seedlings have difficulty in becoming established; it can spread rapidly vegetatively. Many original infestations had an almost circular form, varying in size from less than one acre to several acres. These areas maintained their circular form and rapidly increased in diameter. The outlying plants originated from rootstocks.

Browsing animals were a factor in disseminating camel thorn. On the dry lands of Kern County, in the areas infested with the weed, one could find large numbers of viable seed in the droppings of horses and cattle. Without question these animals aided the spread of the pest, inasmuch as it was the custom to move them from one large ranch to another.

The date of its first introduction in California, although not known, is prior to 1915. According to Parish (1920), K. Brandegee reported camel thorn at Mecca in 1915, and apparently it was troublesome at Brawley in 1920.

During the last few years an eradication campaign, instituted coöperatively by the State Department of Agriculture and the several counties where infestations occur, has resulted in almost complete control.

## CYTISUS

*Cytisus scoparius* Link. (Scotch broom), a native of Europe, is commonly planted as an ornamental. It has escaped from cultivation and become a serious pest near Georgetown in Placer County. It is also found at Millbrae in San Mateo County, and at scattered points in Amador, Eldorado, and Nevada counties.

*Cytisus monspessulanus* L. (Spanish broom), a Mediterranean species, has escaped and become naturalized in several localities: Santa Cruz Mountains, Oakland, Eureka, and elsewhere. *Cytisus canariensis* Ktze., from the Canary Islands, is occasionally an escape.

## LATHYRUS

*Lathyrus Aphaca* L., a Eurasian species, has been reported by Howell (1940a) from Fort Bragg, where it was collected during the summer of 1938. It has become naturalized in middle and southern Oregon west of the Cascade Range.

## LOTUS

*Lotus angustissimus* L., an Old World immigrant, is reported by Howell (1939b) from the Sonoma County coast  $1\frac{1}{2}$  miles north of Fort Ross, 1937; Wright's Beach, Sonoma County, 1938; and near Stillwater Cove, Sonoma County, 1938.

## MEDICAGO

*Medicago apiculata* Willd., a naturalized European medick, is widely distributed, although nowhere very abundant. Jepson (1909-36) records it from Crescent City, Redding, Eureka, Norman in Glenn County, Rio Linda in Sacramento County, near Ione, Knights Ferry, Sonoma Valley, near Berkeley, San Francisco, New Almaden, and Garvanza, Los Angeles; whereas Munz (1935) cites it from Los Angeles, Pasadena, Claremont, and Yuma.

*Medicago arabica* All. (spotted medick), also naturalized from Europe, occurs along the coast from Eureka to San Francisco Bay and is apparently spreading.

*Medicago hispida* Gaertn. (bur clover) is described by Jepson (1909-36) as "a rare instance of an aggressive immigrant herb having a high economic value." It is a European plant that has become well established throughout California. Hendry and Bellue (1925) have shown it was present during the Mission Period. Torrey (1859) reported it as abundant throughout California. Brewer and Watson (1876) call it "common," and Bolander (1870) lists it near San Francisco. Hilgard (1890) pronounces it "generally obnoxious to farmers." Davy (1898b) mentions it and also *M. apiculata* as occurring in Calaveras County. Davy (1902) refers to *M. hispida* as among the plants then invading the stock ranges of northwestern California, replacing small barley grass, squirrel tail, and soft chess. As Piemeisel and Lawson (1937) point out, *M. hispida* var. *denticulata* (California bur clover) abounds on overgrazed areas of the tree savanna and Pacific grassland of the San Joaquin Valley, but is playing no part on recently abandoned farm lands.

*Medicago lupulina* L. (black medick), listed by Brewer and Watson (1876), is a native of Europe, collected early at Los Angeles in 1891, San Francisco in 1898, Redlands in 1906, and Santa Monica in 1918. It is now widely distributed, usually in lawns and waste places. The culti-

vated Asiatic plant, *M. sativa* L. (alfalfa), sometimes escapes and grows somewhat spontaneously in moist places. Davidson (1893) doubted whether it would survive in California if cultivation were stopped. It was first raised here about 1854.

#### MELILOTUS

*Melilotus alba* Desr. (white sweetclover), naturalized from Europe, is sometimes cultivated for forage, but not infrequently occurs in waste places as a weed. Early collections were at Buckman's Spring in San Diego and at San Bernardino in 1890, at Los Angeles and San Francisco in 1891, at Clear Lake in 1892, in the lower Sacramento River region in 1893, and in Calaveras County, 1895.

*Melilotus indica* All. (annual yellow sweetclover), also from Europe, is commonly cultivated in California as a green-manure crop, and has frequently escaped. Hendry and Bellue (1925) have evidence of its introduction during the Mission Period. Torrey (1856) reports it from Los Angeles. Brewer and Watson (1876) list *M. indica*, but not *M. alba*. *M. officinalis* Lam. (yellow sweetclover), an introduction from Eurasia, is reported by Munz (1935) from Death Valley.

#### TRIFOLIUM

The adventive species of *Trifolium* in California are all from Europe. *Trifolium dubium* Sibth. (shamrock) is fairly well distributed, being found in Del Norte, Humboldt, Nevada, and Calaveras counties, and also in the San Francisco Bay region. *T. hybridum* L. (alsike clover) sometimes cultivated as a forage and pasture crop, has frequently escaped. It occurs in the mountain meadows of the Sierras and in Humboldt and Siskiyou counties. *T. incarnatum* L. (crimson clover) is found at Healdsburg. *T. pratense* L. (red clover), a valued forage plant, has become naturalized in mountain meadows throughout the state, and also is in the Delta region. *T. procumbens* L. (hop clover) has become established sparingly. Parish (1920) lists it as a plant "well established (in 1894) along the banks of a stream in Potato Canyon, altitude 3,000 feet in the San Bernardino Mountains." It was collected between Eureka and Arcata in 1902 and between Korb and Angels Ranch in Humboldt County in 1914. *T. repens* L. (white clover), escaping from cultivation in pastures and lawns, is widely distributed in the state: the coastal region; the lower Sacramento River, the Sierra Nevada, and Inyo County. *T. fragiferum* L. (strawberry clover), a widespread species from central Europe south to the Mediterranean region, is recently recorded in Siskiyou County, where it is said to be establishing itself. Probably the seed was introduced in pasture mixtures.



## ULEX

*Ulex europaeus* L. (gorse) is an introduced ornamental from Europe. In the coastal counties, from Marin to Humboldt, it has escaped and in places forms dense thickets, becoming a pest in open areas. K. Brandegee (1892b) reported it as covering many acres at San Francisco. It was collected in 1911 along the bluff at Playa del Rey; and later at San Rafael, Bodega, and Eureka.

## VICIA

*Vicia sativa* L. (common vetch) is a native of Europe and a common forage and covercrop plant in many parts of the world. In California it occasionally escapes from cultivation and, in the Delta region, becomes troublesome in grain fields. The earliest collections, according to Parish (1920), were at Sonoma in 1862, at Los Angeles in 1890, at Pomona in 1896, and at San Bernardino in 1906.

*Vicia villosa* Roth (hairy vetch), also a European species, is an occasional fugitive. In 1918 it was collected at Fontana near Rialto. According to Wiggins (1933), "in the vicinity of Humboldt Bay . . . it competes successfully with the native and introduced grasses on open hillsides and inner sand dunes." It is well established in many localities from Santa Cruz to Washington.

*Vicia Cracca* L. (bird vetch), a native of Europe and the northeastern United States, has become naturalized in northern Modoc County. *V. Faba* L. (broad bean), an Asiatic species extensively cultivated in California is, according to Jepson (1909-36), "sometimes a transient escape." *V. hirsuta* S. F. Gray (tiny vetch), from Europe, has become naturalized in California, occurring in the coastal region and the Sierra Nevada foothills. *V. tetrasperma* Moench. (slender tare), introduced from Europe, is, according to Jepson (1909-36), "locally and sparingly naturalized, 10 to 1,000 feet: coastal districts." The occurrence of *V. atropurpurea* Desf. (purple vetch) is reported at Point Reyes, at Hydesville, and in Monterey County, whereas *V. pannonica* Crantz (Hungarian vetch) is reported from Rincon Valley, Sonoma County.

## LINACEAE

## LINUM

*Linum angustifolium* Huds. (narrow-leaved flax), a native of regions about the Mediterranean, is reported by Howell (1939a) as having become a permanent element in the indigenous vegetation along the California coast as far south as San Mateo County. He cites collections from Fort Bragg, 1921; near Bodega Bay, 1939; and Montara Point, San Mateo County, 1903.

## OXALIDACEAE

## OXALIS

*Oxalis cernua* Thunb. (Bermuda buttercup) has been found in truck gardens in the San Francisco Bay Peninsula and in southern California. It is a native of South Africa. It was collected in 1928 in a walnut grove near San Juan Capistrano, where it is reported to cover the ground as if sown for a covercrop. Eastwood (1932*b*) states: "It has become very common near Colma, San Mateo County. Some cabbage fields are golden when it is in flower, suggesting the inaccurate common name, Bermuda buttercup." Munz (1935), who records it from Claremont, San Bernardino, Highland, Tustin, Oceanside, San Diego, and Catalina Island, calls it a common weed of the walnut and orange groves in southern California.

*Oxalis corniculata* L. (yellow oxalis), a native of Europe, is distributed throughout the state, especially in lawns, greenhouses, and gardens. Hendry and Bellue (1925) found the seeds in adobe bricks of Rancho La Natividad, Salinas, constructed in 1837. Specimens are among the Russian collection made in Sonoma County, 1840–41 (Howell, 1937*c*). Bolander (1870) records it from the Bay region. It was collected at San Bernardino in 1900, San Diego in 1903, and Santa Barbara in 1908. Hilgard (1890) reports it as locally a very persistent weed.

*Oxalis hirta* L., a native of the Cape Province, is reported by Rose (1933) from Montebello, Los Angeles County, and from near Salinas. Concerning *O. laxa* Hook. & Arn., Rose (1933) states that the only collection (by Howell) known from North America was made in California 7½ miles from San Andreas on the road to Valley Springs, Calaveras County. It is a native of central and southern Chile. *O. stricta* L. (upright yellow oxalis), a native of the eastern United States, was first recorded by Bolander (1870) from the Bay region.

## GERANIACEAE

## ERODIUM

The introduced species of *Erodium* within our borders are *E. Botrys* Bertol. (broad-leaf filaree), *E. moschatum* L'Her. (white-stem filaree), *E. cicutarium* L'Her. (red-stem filaree), *E. malachoides* (L.) Willd., and *E. cygnorum* Nees.

Judging from the investigations of Hendry and Bellue (1925) *Erodium cicutarium* was widely distributed here before California was colonized by Europeans—that is, before 1769. In 1844, reports Fremont (1845), *E. cicutarium* "covered the ground like a sward" in the Sacra-

mento Valley; as he passed through the lower San Joaquin Valley he found "instead of grass, the whole surface of the country closely covered with it." Torrey (1859) states that in 1856 it was "common in New Mexico and throughout Sonora and California." Brewer and Watson (1876) say regarding *E. cicutarium*: "Very common. . . . It has been generally considered an introduced species, but is more decidedly and widely at home throughout the interior than any other introduced plant, and according to much testimony it was as common throughout California early in the present century as now." *E. moschatum* they report from "Los Angeles (Antisell), Santa Inez Valley and northward, as well as southward in Mexico. Doubtless introduced from Europe." Of *E. Botrys* they write: "Sacramento Valley, E. S. Greene, introduced from Europe." Bolander (1870) finds *E. cicutarium* near San Francisco. Greene (1891) mentions it and also *E. moschatum* as common near the San Francisco Bay: "Though well established in California from a very early period, neither of them is with reason believed to be indigenous."

Parish (1890-91) states:

Every western collector from the Mexican to the Dominion line finds *E. cicutarium* in abundance. Indeed, Brewer and Watson incline to regard it as a native, and in his Bibliographical Index Dr. Watson prints it in ordinary type as an indigenous species. Dr. Trelease, the latest monographer of the order, has no hesitation in pronouncing it an introduction. . . . The seed is adapted for conveyance in the fleece of sheep. Indeed, it rather would have been strange had it not been brought over by the Spanish flocks, or carried wherever their successors have wandered.

But *E. moschatum*, which has a seed essentially the same, has not established itself as widely as its companion. It does not appear to have been found by the botanists of the Mexican boundary, but first appears in the collection of the Pacific Railroad Survey (1856). The Botany of California returns it only from Los Angeles and Santa Inez Valley. Dr. Palmer got it below our boundary on Guadalupe Island and on the adjacent mainland, at San Quintin Bay. Professor Greene has also collected it at the former station, and on San Miguel Island in the Santa Barbara channel. Professor Brewer does not even enumerate it in his exhaustive account of the Foreign Plants of the United States for the tenth census. These reports indicate that it is mostly confined to the southern extremity of the state. Dr. Trelease indeed calls it a mere "roadside weed." On the red-clay foothills of the San Bernardino Valley it, however, grows in great abundance, and so luxuriant as sometimes to be cut for hay. On these hills it is much commoner than its congener. On black adobe soil it is much less abundant, and on sandy very scarce. *E. cicutarium* nearly reverses this distribution, but its preferences of soil are less pronounced, and this may have aided in its wider diffusion since it appears to be able to thrive under a greater variety of conditions. . . . To the plant-eradicating sheep, which have wrought such destruction to our native flora, . . . California probably owes the introduction of its most valuable and abundant forage plants, namely, alfalfa, bur clover and wild oats. . . . All are of Mediterranean origin.

On many stock ranges of California, *Erodium cicutarium* and *E. moschatum* are dominant species. On the northwestern ranges, according to Davy (1902), with the advent of white settlers and their domestic animals, the primitive forage plants (chiefly "bunch-grasses") were supplanted by wild oat and *E. cicutarium*; then followed an invasion by common foxtail, squirrel-tail grass, and soft chess; and then (in 1902) a third immigration, with *E. moschatum* playing an important rôle.

Piemeisel (1932), discussing the abandoned areas of the Mojave Desert, points out that land denuded of brush, where there has been no plowing, is grown up principally with *Erodium cicutarium* and *Bromus rubens*. The west side of the San Joaquin, once a desert-sage type of vegetation but now greatly denuded, is clothed with a variety of introduced plants, including a high percentage of the filarees. In the tree savanna of the San Joaquin, as Piemeisel and Lawson (1937) show, the primitive perennial cover among the oaks has been replaced by an annual cover of grasses and herbs, including *E. cicutarium*, *E. moschatum*, and *E. Botrys*. Overgrazed areas of the Pacific grassland are occupied by numerous annuals, including *E. cicutarium* and *E. Botrys*, the most widely distributed being *B. rubens* and *Erodium* species. *E. cicutarium* is also an important invader of overgrazed areas and abandoned farm lands of the "desert salt-bush" association, and all three species of *Erodium* named above invade cleared and cultivated areas in the "spiny salt-bush association" and in the "lowland types" of vegetation.

*Erodium malachoides* (L.) Willd. has been collected on the Berkeley campus, at Mt. Diablo, and at several points in the northern Sacramento Valley. *E. cygnorum*, a native of Australia, is reported by Parish (1920) as locally established at a single station near San Diego, where it was collected in 1916; also it is reported by Munz (1935) at Corona. The first three species cited above are widely distributed throughout the state.

#### GERANIUM

*Geranium carolinianum* L. (Carolina geranium), naturalized from the eastern United States, although infrequent, is widely distributed in California.

*Geranium dissectum* L. (cut-leaved geranium), an introduction from Europe, occurs chiefly in the coast ranges and in Amador County. It has been collected at Carmel, Alviso, Palo Alto, Mt. Davidson, Mt. Diablo, near Ione, Alderney in Marin County, Hopland, Fort Bragg, Eureka, the Palomar Mountains, and Fairfield.

*Geranium molle* L. (doves-foot geranium), also from Europe, occurs infrequently in the coastal region from San Francisco to Del Norte



County and at a few localities in southern California. Collections have been made at San Francisco, Mt. Tamalpais, Humboldt Bay, Hydesville, Korbel to Angel's Camp in Humboldt County, Gilbert Creek in Del Norte County, Claremont, San Bernardino, Sawtelle, and Rose Canyon in San Diego County.

*Geranium pilosum* Forst. (traveler's geranium), an Australasian species, is sparingly naturalized along the coast, having been collected at Trinidad Station in Humboldt County, at Inverness, Mt. Tamalpais, and Berkeley. *G. pyrenaicum* Burm., a European species, was reported in 1905 from Mt. San Gorgonio, 7,000 feet elevation. *G. sibiricum* L. (Siberian crane's-bill), native to Siberia, is adventive at Olema in Marin County.

#### PELARGONIUM

Parish (1920) reports *Pelargonium clandestinum* L'Her., a native of Europe, as an escape in a neglected lawn at Santa Ana in 1904; and *P. zonale* L'Her., a native of South Africa, as a fugitive in the hillside chaparral at Oceanside, in 1897.

### EUPHORBIACEAE

#### EUPHORBIA

*Euphorbia exigua* L. (dwarf spurge), a European species, has been found in Santa Clara County, according to Norton (1900).

*Euphorbia helioscopia* L. (water weed) is reported by Munz (1935) as "naturalized from Europe near El Monte (Wheeler)." It has been collected and reported as a pest in fields at Elk, Mendocino County.

*Euphorbia Lathyrus* L. (caper spurge), also from Europe, has been found as an escape at Myer's Ranch in Humboldt County, West Berkeley, Skylonda in San Mateo County, Jolon, Morro, Lompoc, Seven Oaks in the San Gabriel Mountains, the San Jose Hills, and the San Jacinto River.

*Euphorbia maculata* L. (spotted spurge), introduced from the eastern United States, occurs sparingly as a street and lawn weed. Parish (1920) reports it as a recent introduction at Pasadena. It has been collected at Marysville, Bear Valley in Nevada County, Ione, Berkeley, Jolon in Monterey County, San Miguel, Pasadena, San Bernardino, San Diego, Ventura, El Monte, and elsewhere.

*Euphorbia Peplus* L. (petty spurge), from Europe, is frequently found in moist shady places. Leeds (1891) in 1883 observed it at Santa Cruz. Parish (1920) says it was rare at San Bernardino in 1885, abundant at San Diego in 1914. It has also been collected at Eureka, Stewart's Point in Sonoma County, Berkeley, Monterey, and Upland.

Of *Euphorbia esula* L. (leafy spurge), a European species, Bellue (1936*d*) remarks:

On June 5, 1936, F. H. Taylor, Agricultural Commissioner of Lassen County, submitted for identification a specimen of leafy spurge collected on the B. A. Chace Ranch in Lassen County. Because of the noxious character of this weed, and the fact that it is not known to be established elsewhere within our boundaries, a further survey of the infestation was promptly made. This revealed seven patches confined to about three acres. The area is bounded by lands utilized for range and the production of oat hay. According to Mrs. Chace, the infestation had existed without appreciable spread for at least forty years because of shallowness of the soil. The first authentic record of occurrence in this state is a specimen in the herbarium of the University of California bearing the label, "Collected by F. C. Chace, Adin, Modoc County, June 1916." This now is known to represent the same site as that recently surveyed, Chace Valley being situated in Lassen County about four miles east and two miles south of Adin, Modoc County. The only other collection from California is a cultivated specimen from the Leonard Coates Nursery in San Jose.

Jepson (1909-36) records a collection by W. T. Davidson, about 1917, in Scott Valley, Siskiyou County. The species has also been observed at Gazelle.

#### MERCURIALIS

*Mercurialis annua* L. (herb mercury), a European weed, has been naturalized locally in San Mateo County, where it abounds in the artichoke fields.

#### RICINUS

*Ricinus communis* L. (castor bean), grown as an ornamental, sometimes escapes, chiefly in coastal southern California. It is native to the warmer parts of Asia and Africa.

#### ZYGOPHYLLACEAE

##### KALLSTROEMIA

*Kallstroemia parviflora* Norton, according to Gander, is well established in a small area near Walnut Hot Springs, where it was collected in October, 1936. It is native from Mississippi to Arizona and Mexico.

#### TRIBULUS

*Tribulus terrestris* L. (puncture vine) is chiefly a native of the Mediterranean region. The earliest reported collection of this species in California was that of Davidson (1903) from Port Los Angeles. Parish (1909 and 1920) reports that it was abundant at Colton in 1908, and that a few plants were found at San Bernardino the same year. He states that it was collected at Bakersfield in 1905. According to Johnson (1932), "Charles F. Collins, formerly Tulare County Horticultural

Commissioner, recalls having first seen the plant at Dinuba in 1901; and some of the older ranchers in Kern and Tulare counties claim to have known it for about forty years." About 1912, puncture vine began to attract much attention and was recognized as a plant which might become a serious agricultural pest. Essig (1914) cites the occurrence of the weed in Placer and Glenn counties and from the coast side of the mountains west of the San Joaquin Valley. By 1920, according to Johnson (1920), the plant was spread "over a large area in the upper San Joaquin Valley, and is found in a nearly unbroken line along the railroads northward to San Joaquin County. In the Sacramento Valley it has been found at Woodland, Durham, and Marysville, and is reported as widespread along the railroads of Tehama County. South of Tehachapi the puncture vine is found from the Mexican border through the Imperial and Coachella valleys to the coastward valleys of Riverside, San Bernardino, Los Angeles, and Orange counties." By 1925 it had reached Glen Ellen in Sonoma County and Lone Pine in Inyo County.

#### ZYGOPHYLLUM

*Zygophyllum Fabago* L. var. *brachycarpa* Boiss. (Syrian bean caper) is an introduction from southwestern Asia. Eastwood (1932c) quotes from a letter from Mrs. Hutchinson, as follows: "*Z. Fabago* has for some time been growing just outside of a ranch near the dry lake in the Muroc region of the Mojave Desert." Munz (1935) reports it as occasional in the Antelope Valley. The State Department of Agriculture has received specimens from Stanislaus County.

#### RUTACEAE

##### RUTA

*Ruta chalapensis* L., a native of Africa, is reported by Parish (1920) as "an escape or fugitive from Mexican gardens, where cultivated as a medicinal herb." Collections have been made at El Monte in 1894, Monterey in 1917, Ventura in 1918, and Kingston in the Mojave Desert. *R. graveolens* L. (common rue), a southern European species, was found by Munz in 1933 growing without cultivation at Garden Grove in Orange County.

#### SIMARUBACEAE

##### AILANTHUS

*Ailanthus altissima* Swingle (tree-of-heaven), now a pest in some localities, was introduced from China. Planted as an ornamental and shade tree, it has occasionally escaped from cultivation. It is fairly abundant in Pleasant Valley, Solano County, and is recorded from Berkeley, Vac-

aville, Petaluma, San Andreas, Angels Camp, La Panza, Grass Valley, Yuba City, and Columbia.

Jepson (1909-36) gives us the following historical note:

The Chinese miners, immigrants in California in gold days, brought with them from China seed of *Ailanthus altissima*, the Tree of Heaven of their temple grounds at home. This seed they planted about the placer mining camps in the Sierra Nevada foothills. The species spread, spontaneously in many places, and its colonies are now a feature of the foothill region, especially about such old-time mining camps as Mormon Bar (Mariposa County), Columbia, Valley Springs (Calaveras County), Angels Camp, San Andreas, and Grass Valley. Frequently used as a dooryard ornamental or shade tree, it has also run wild in the Coast Ranges about Parkfield (Monterey County), Berkeley, Petaluma, St. Helena, Vacaville, and Fruto (western Glenn County). This species is obviously continuing to spread locally. It is, thus far, the only exotic arboreous species in California which is aggressively spontaneous. In some deciduous fruit orchards, as in Pleasant Valley, northwestern Solano County, it is a pest, the seedlings and shoots, in spite of cultivation, standing thickly after the manner in which *Pteris aquilina* displays itself on a hillslope that has been cleared of woody cover.

## ANACARDACEAE

### SCHINUS

*Schinus Molle* L. (Peruvian pepper), according to Munz (1935), has occasionally become naturalized in washes, canyons, and the like. It was introduced from Europe.

## MALVACEAE

### ABUTILON

*Abutilon indicum* Sweet (country mallow), an introduction from the Hawaiian Islands, occurs as an escape in cities and towns. *A. Theophrasti* Medic (velvetleaf), from Asia, occasionally escapes in southern California and north to Yuba County. Parish (1920) states that in 1917 it was collected in an orange orchard at Riverside, the only reported collection from the state at that date. Recently specimens have been taken at Stockton and Modesto.

### ANODA

*Anoda cristata* (L.) Schlecht. is reported (Howell, 1935b) as an abundant and persistent garden weed at Placerville by Ivan W. Lilley. It has also been collected near Stockton. It is a native of Mexico.

### HIBISCUS

*Hibiscus Trionum* L. (flower-of-an-hour) is reported by Parish (1920) as "a waif in an orange orchard at Riverside," being collected there in 1917. Stacey (1933) collected it at Stockton. It was introduced from southern Europe.



## LAVATERA

*Lavatera assurgentiflora* Kell. (tree mallow) is a native of the Santa Barbara Islands; as early as 1853 it was brought to the gardens on the mainland, where it has been used as a hedge windbreak along the coast from Mendocino County to San Diego. In places, apparently, it has escaped from cultivation.

*Lavatera cretica* L. (Cretan mallow) is a native of the Mediterranean region. According to Howell (1935a), "at present it is one of the commonest weeds in vacant lots on the Marina, and its extension southward down the San Francisco Peninsula along the Bayshore Highway has been noted. This is perhaps the first occurrence of the plant to be noted in the United States." It was collected, however, in San Francisco as early as 1912.

## MALVA

The malvas growing in California without cultivation are of European origin. *Malva borealis* Wallm. (bull mallow) was reported by Parish (1890-91) from Old San Bernardino and collected by Abrams (1904) near Mesmer, Los Angeles County. Jepson (1909-36) reports it from Willows, Stockton, Berkeley, Alviso, and San Bernardino Mission. It is very common about Davis.

*Malva parviflora* L. (cheese-weed) is the most common malva in California. Seeds were found in adobe bricks of La Soledad, Soledad, constructed in 1791; of San Fernando Rey de Espana, constructed in 1797; and of San Jose de Guadalupe, Mission San Jose, constructed in 1797. A very early collection, according to Parish (1920) was from San Diego in 1862. Hilgard (1890) says: "Of the Malvaceae, almost the only member . . . really a weed is *Malva parviflora*." Jepson (1893) lists it among the riparian plants of the lower Sacramento.

*Malva rotundifolia* L. (dwarf mallow) is found occasionally within our borders in gardens, farmyards, waste places, and—sometimes—in cultivated grounds and new lawns. Brewer and Watson (1876) say that this weed "may appear in California." Bolander (1870) finds it, however, near San Francisco. Jepson (1909-36) cites it from Yreka, Little Hot Springs, Modoc County, Surprise Valley, Modoc County, Meadow Valley, Plumas County, Fort Ross, San Francisco, Berkeley, and Mariposa. *M. sylvestris* L. (high mallow) has been collected at San Francisco, Guerneville, Rawhide in Tuolumne County, and Redlands. It is sparingly escaped from gardens. *M. pusilla* Smith occurs at Alton in Humboldt County and at several stations in the southern counties. Eastwood (1898) collected it in San Francisco.

**MODIOLA**

*Modiola caroliniana* G. Don. (bristly mallow), from tropical America, has been found at Ferndale in Humboldt County, Auburn, Los Baños, Claremont, Los Angeles, San Bernardino, Basset, Riverside, and the Swift Ranch in Madera County. An early collection, according to Parish (1920) in Los Angeles County, was in 1892. Ball (1936) reports it from Calaveras and Sacramento counties, particularly where Ladino and white clover plantings have been made. Only recently it has attracted attention as a lawn weed in the San Francisco Bay region.

**HYPERICACEAE****HYPERICUM**

*Hypericum perforatum* L. (Klamath weed or St. Johnswort), today infests about 100,000 acres of land, chiefly in the northwest counties. It is regarded as a range weed of major importance, not only because it has crowded out desirable forage species, and thus reduced the carrying capacity of the range, but because it is somewhat poisonous to livestock. Its relatively recent introduction and its rapid spread are of especial significance. Hilgard (1890), discussing the principal weeds of California, does not list Klamath weed. Davy (1902) does not mention it in the area covered by his thorough range studies, which included counties now heavily infested. In a letter dated in July, 1938, he says: "If this plant had been common in the region when I carried out my study of those ranges, I should certainly have mentioned the fact. When I first began to study the flora of California, in 1893, and for some years thereafter, I paid particular attention to the alien flora, being attracted by the plants with which I had been familiar in Britain." T. Howell (1903), however, referring to the territory north of California, west of Utah, and south of British Columbia, says of *H. perforatum*: "Very common in fields and along roadsides." Oddly enough, in view of this report, Piper states in 1906 that Vancouver is the only locality where he has observed it in the Northwest.

The species was early reported in the United States: in 1793 from Lancaster, Pennsylvania; in 1814 from the same state; later, in many eastern localities.

Some believe that Chinese miners in the fifties brought the seed of *Hypericum perforatum* into Humboldt County with packing material, since it was first discovered near their dwellings; and others that the early white men who mined in the region sowed the seed in the hope of securing forage for their burros. Most plausible, however, is the story

that it was introduced from the northeastern states into Oregon, probably the Willamette Valley, by the Oregon Trail pioneers of the forties and fifties, and spread southward into the northwest counties of California. The following statement in a letter from E. D. Merrill supports this view:

We have given considerable attention to the Klamath weed matter, i.e. through a direct comparison of numerous specimens of *Hypericum perforatum* from various parts of the world, including Europe, North Africa, Asia, eastern and western North America, in the hope that we might find some slight but constant differences between the forms from various parts of the species' extensive range; we fail to note any such differences, the plants being rather remarkably uniform.

The species is a native of Europe, and I suspect may be introduced in northern Asia and in China, as it is in the United States and Canada. It was introduced into eastern America apparently in the colonial period, and is now very widely distributed. It does not seem to be a very bad pest in the more humid regions, and I suspect that its perniciousness in California is a response to climatic conditions, in that it finds less competition from native and other introduced plants and tends to become dominant because of its vigor and adaptability.

I, personally, do not think that it was an introduction from China into California, but consider it more probable that it reached the west coast in packing material from the East. My reason is simply this. It is not a very widely distributed plant in China, judging from extant collections, and does not appear to be a dominant weed there, at least in those regions associated with commerce with the United States. It is recorded from China only from a very few provinces, these older records supplemented by recent collections giving its occurrence in Shantung, Kiangsi, Shensi, Yunnan, Szechuan, and Kweichow; with the exception of Shantung, these are all interior provinces. It is unknown from Kwangtung and Fukien, whence many of the Chinese in California came, and is also unknown from the provinces near Shanghai and Tientsin, the two other great export ports. The likelihood of its having been used by the Chinese in China for packing purposes is hence very remote, unless such shipments originated far in the interior; and, even in such case, all types of supplies would be repacked for export at the port of shipment to the United States.

Gander states that *Hypericum perforatum* was collected in June, 1938, by T. O. Brodeur,  $\frac{1}{8}$  mile west of Wynola in San Diego County. This is its first reported occurrence in southern California. It has also been found near Mt. Hamilton in Santa Clara County.

## TAMARICACEAE

### TAMARIX

*Tamarix gallica* L. (French tamarisk) is used extensively in California as a windbreak and an ornamental. Escaping from cultivation, it now occurs in widely scattered localities. It is a Mediterranean species. Parish (1920) reports that in 1915 in Death Valley it abundantly bordered Furnace Creek, spreading from a planting at the head of the stream. Its occurrence as an escape is also recorded for San Gabriel River, Wilming-

ton, Ontario, Salton Sea, Thousand Palms, Sulphur Creek in southwest Colusa County, Warm Springs in Alameda County, White Sulphur Creek in Napa Valley, and Cache Creek on the Tehachapi Pass. *Tamarix parviflora* DC. (small-flowered tamarisk), a south European species, has escaped in a few localities, as in the San Benito river bed, San Benito County, and Mission Valley in San Diego County.

## CISTACEAE

### HELIANTHEMUM

*Helianthemum guttatum* Miller, an Old World species, has been collected at two points in Calaveras County: near Buena Vista and at Lancha Plana. Collections were first made in 1936.

## RESEDACEAE

### RESEDA

The species of *Reseda* adventive in California and growing there without cultivation are all European. *Reseda alba* L. (white cut-leaved mignonette) is adventive in southern California, at San Bernardino, Glendora, Ventura, Santa Barbara, Pasadena, Ojai, and near Pala in San Diego County. An early collection was in 1893 at Pasadena. In Orange County, E. Johnson, in correspondence, states that it is scattered for about one mile on the Pacific Electric right-of-way. *R. lutea* L. (yellow mignonette), according to Gander, is a garden escape about Los Angeles and near Poway in San Diego County. *R. Luteola* L. (dyer's rocket) is reported by Gander from near Poway in San Diego County, where it was collected in 1936. *R. odorata* L. (common mignonette), an occasional escape in Marin County, has also been collected by Gander at San Diego and Ocean Beach.

## PASSIFLORACEAE

### PASSIFLORA

*Passiflora incarnata* L. (passion-flower), native of eastern United States from Virginia to Missouri and southward, is well established in orchards near Newcastle, Placer County.

## LYTHRACEAE

### LYTHRUM

Of *Lythrum tribracteatum* Salsm., J. T. Howell (1931) states: "In the vicinity of Elmira, Solano County, the beds of summer-dried rain-pools are enlivened with brightly flowered mats of this annual which is adventive from lands around the Mediterranean Sea."



## ONAGRACEAE

## GAURA

Of *Gaura sinuata* Nutt. (wavy-leaved gaura), a native of the plains of the United States, Gander (1937) says: "It was first reported in July, 1930, when W. V. Shear collected specimens at Carlsbad. It was found growing along the highway two miles north of Lake Hodges on March 6, 1934, and was thoroughly established in a field at Santa Ysabel on July 10, 1935." Today it is fairly common in central and southern California. According to Ball (1936) it has become established in Wheeler Canyon, Ventura County, and E. Johnson reports, in correspondence, its occurrence at Yorba Linda in Orange County, at Corona in Riverside County, at Van Nuys, Redondo, Puente, Pomona, and Baldwin Hills in Los Angeles County, and at Camarillo, Santa Paula, Balcom Grade, and Conejo in Ventura County.

## OENOTHERA

*Oenothera speciosa* Nutt. (evening primrose), also a native of the plains region of the United States, is an occasional escape at Pomona, Chino, and Hawthorne. E. Johnson reports in 1939 the variety *Childsii* (Mexican evening primrose) as persistent in an avocado orchard at Escondido in San Diego County.

## UMBELLIFERAE

## AMMI

*Ammi majus* L. (Bishop's weed), a native of Europe, has thus far become naturalized only in the Napa Valley. Jepson (1909-36) records collections at Union Station, 1917; Salvador School, 1920, and Yountville, 1893. *A. Visnaga* Lam. (toothpick weed), also European, has been found in the Santa Clara Valley and at Long Beach. It was probably first collected at Saratoga in 1893.

## ANETHUM

*Anethum graveolens* L. (dill), a garden plant from the Old World, has occasionally escaped from cultivation. Parish (1890-91) observed it "in great abundance by roadsides and in fields in some of the environs of San Bernardino, so that it may be regarded as fully established." It is also recorded from Long Beach, Los Angeles, and Oakland.

## ANTHRISCUS

*Anthriscus vulgaris* (L.) Pers. (bur chervil), a European species thus far rare in California, is reported by Jepson (1909-36) from Cloverdale, St. Helena, and Jolon. The earliest collection was at St. Helena in 1908.

### APIUM

*Apium Ammi* Urban, native to the southern states and tropical regions, has become established at Lompoc. There is a specimen in the Santa Barbara Museum of Natural History.

Of *Apium graveolens* L. (common celery), a common European garden plant that frequently escapes from cultivation, Brewer and Watson (1876) say: "Rare in California, but has been collected in salt marshes from Santa Barbara to San Diego, and also at Fort Tejon." Davidson (1893), reporting on the immigrant plants of Los Angeles, remarks: "Of all the Umbelliferae this is the most firmly naturalized and must have been introduced at an early period." There have been additional collections at Ramona, Riverside, San Bernardino, Claremont, Carmel River, South Berkeley, Suisun Marshes, Ballona, Arlington, Chino, Laguna, Otay, Downey, Pomona, and San Jacinto.

### CONIUM

*Conium maculatum* L. (poison hemlock), a native of Europe, is now widespread throughout California at low altitudes. According to Brewer and Watson (1876), it was sparingly introduced in waste places in the neighborhood of the older towns. Bolander (1870), however, does not mention it as occurring near San Francisco Bay. It was collected at Truckee in 1892. Greene (1891) records it as "rather rare in California." Davy (1898*b*) finds it established at Angel's Camp. Collections were made at Pasadena and Los Angeles in 1894. Parish (1920) reports it as introduced at San Bernardino about 1905. Besides these localities, it is recorded from Oak Glen, El Monte, Long Beach, San Andreas, Yreka, Falks Mill on the South Fork of the Elk River, Greenwood in Mendocino County, Drakes Bay, Lake Merced, Alviso, Carmel, San Luis Obispo, Arroyo Grande, and Lytle Creek in the San Gabriel Mountains.

### CORIANDRUM

*Coriandrum sativum* L. (coriander), from the Mediterranean, occasionally escapes from cultivation. According to Parish (1920), it was collected in 1888 at Los Angeles, in 1894 at San Diego. It is also cited from Anaheim and Truckee.

### DAUCUS

*Daucus Carota* L. (wild carrot) has escaped from gardens and become widespread as a weed in California. It is a European species. Hendry and Bellue (1925) list it among the plants introduced during the Mission Period. It is not mentioned, however, by Brewer and Watson (1876). Hilgard (1890) refers to it; and Parish (1890-91), upon find-

ing several dozen plants in a meadow at St. Elmo, remarks: "This is the first recorded appearance of this plague in California, although it is probably to be found in other parts of the state." It was collected at Riviera in 1892, at Los Angeles in 1896, and at Claremont in 1897. Other localities, recorded by Jepson (1909-36) are Bodega in Sonoma County, Sonoma, Alameda, Alvarado, Monterey, San Bernardino, and Smartsville in Yuba County.

#### FOENICULUM

*Foeniculum vulgare* Hill (fennel), another European garden plant, has become a widely naturalized weed in California. It is not listed by Brewer and Watson (1876). Hilgard (1890) reports it as conspicuous in the Bay region; Parish (1890-91), as rare in 1890 at San Bernardino. Collections were made at Los Angeles in 1898, at Ballona in 1902, and at Claremont and Elsinore in 1918. Jepson (1909-36) records it from Whitmore in Shasta County, Lake County, Sacramento, Batavia in Solano County, Vacaville, St. Helena, Benicia, Berryessa in Santa Clara County, Monterey, San Luis Obispo, Los Angeles, and San Bernardino.

#### PASTINACA

*Pastinaca sativa* L. (wild parsnip) has escaped from cultivation and become locally naturalized. It is a European garden plant. It is not recorded by Brewer and Watson (1876). Parish (1890-91) states: "First collected this plant in 1882 in Edgar Canyon, near the San Geronio Pass. . . . About five years ago it began to appear by the roadside near San Bernardino, and is yearly becoming more abundant." Other localities are Redlands, Cold Water Canyon in the San Gabriel Mountains, Cienega near Los Angeles, Boulder Creek in the Santa Cruz Mountains, Scott Valley in Lake County, Comptche in Mendocino County, and Sacramento.

#### PRIMULACEAE

##### ANAGALLIS

*Anagallis arvensis* L. (red pimpernel) is a common naturalized European plant in California. It occurs chiefly near the coast, but also frequently in the interior valleys. Specimens are in the Russian collection made in Sonoma County in 1840-41 (J. T. Howell, 1937c). Torrey (1856) records it from San Gabriel and San Bernardino; Brewer and Watson (1876) from Santa Barbara and Ventura in 1871; Bolander (1870) from the vicinity of San Francisco. Parish (1890-91) says that it was then becoming increasingly common. *A. arvensis* L. var. *coerulea* Ledeb. (blue pimpernel) was collected at Fallbrook in 1884, at Los Angeles in 1918. Jepson (1923-25) records the variety from Mt. Diablo.

## LYSIMACHIA

*Lysimachia Nummularia* L. (moneywort), a European species naturalized in the eastern United States, is well established in the American Valley near Quincy, where, according to Keck (1933), it was collected in 1914. According to Keck, a hanging basket of *Lysimachia* brought across the plains from Kansas in a covered wagon "was the ancestor of the very numerous colonies . . . that now spot the meadow of American Valley and which, we were told, have spread to some extent, at least, into the surrounding woods."

## PLUMBAGINACEAE

## LIMONIUM

*Limonium sinuatum* Mill., from the Mediterranean region, has been collected by Gander as an escape about San Diego.

## APOCYNACEAE

## VINCA

*Vinca major* L. (periwinkle), a native of Europe, has escaped from gardens, especially near the San Francisco Bay, and grows without cultivation along water courses in protected places.

## ASCLEPIADACEAE

## ARAUJIA

According to Parish (1920), *Araujia sericifera* Brot., a native of Persia, occasionally cultivated, was a fugitive at Riverside in 1914 and was increasing in 1918. It is not otherwise known from the state.

## CONVOLVULACEAE

## CONVOLVULUS

Jepson (1923-25) describes fourteen different species of *Convolvulus* as occurring in California. Most of these are natives, but three, *Convolvulus arvensis* L. (wild morning-glory), *C. pentapetaloides* L. (small-flowered wild morning-glory), and *C. sepium* L. (hedge bindweed), are European species.

*Convolvulus arvensis*, the only species of major significance within our borders, is generally distributed at lower altitudes throughout the state; a large portion of the cultivated lands are infested. Bolander (1870) lists it as occurring near San Francisco; Brewer and Watson (1876) as naturalized there. Parish (1920) reports morning-glory at San Bernardino in 1890, and at Descanso in 1897. Hilgard (1890) brands



the species as "the most dreaded of the perennial weeds." Jepson (1893) lists *C. arvensis* from the lower Sacramento River. This pest was undoubtedly introduced into California several years before 1870, but up to 1890 it probably did not attract serious attention. It has spread rapidly, however, since the beginning of the century and is today one of the most widespread and troublesome weeds of orchards, vineyards, and cultivated fields.

*Convolvulus pentapetaloides* is relatively unimportant in California, being found in grain fields in the lower San Joaquin Valley and south to San Diego. Greene (1894) records it as "common in fields along the eastern base of the Mt. Diablo Range." According to Parish (1890-91), the species was collected in 1884 by Cleveland, who found it in abundance "along and near a stony road in the Sweetwater Valley, ten miles from San Diego." It was collected at San Diego in 1902, at La Jolla in 1914, at Redondo in 1902, and at San Pedro in 1903.

*Convolvulus sepium*, although a pernicious weed in the eastern United States, is not widespread in California; it occurs chiefly in swamp lands in the southern part of the state, principally about Los Angeles and San Bernardino.

#### CUSCUTA

*Cuscuta planiflora* Tenore (small-seeded alfalfa dodder), an introduction from Europe, occurs here and there in California. *C. racemosa* Martius var. *Chiliana* Engelm. (Chilean dodder), from Chile, also occurs within our borders, infesting alfalfa.

#### DICHONDRA

*Dichondra repens* Forst., naturalized from the tropics, is fairly common in certain sections of the state, occurring in the Eldorado County foothills, at San Francisco, Del Mar, and San Diego.

#### IPOMOEA

*Ipomoea hirsutula* Jacq., a garden plant from tropical America, has become naturalized in coastal southern California. In 1915 a few plants were found in an orange grove at Riverside, and in 1938 E. Johnson, in correspondence, reports its collection in Palo Verde Valley. Later collections have been made at Los Angeles and at San Diego. Of *I. purpurea* (L.) Lam. (morning-glory), also a native of tropical America, Parish (1890-91) comments as follows:

The morning-glory is reported in the synoptical flora from San Diego, collected by Mr. Cleveland, and Dr. Gray suggests that it may be indigenous there, a conjecture that is repeated in the *Botany of California*. It is now, however, well-founded,

the plant in the southern counties being too often a very troublesome weed in orchards, vineyards, or gardens. As such it has long had a bad reputation among horticulturists, who find it nearly impossible to eradicate it from grounds in which it has once become established. It is especially troublesome in vineyards, which can only be cultivated early in the season, and where the clambering stems can easily overrun the low stocks to which the grape is pruned. Mr. Lyon tells me of a forty-acre vineyard near Los Angeles entirely ruined by this climber.

## BORAGINACEAE

### ECHIUM

Gander (1937) finds *Echium plantagineum* L. (purple viper's-bugloss) growing abundantly in a meadow and around a spring by the roadside near De Luz, San Diego County, May 1, 1935. It is a native of Europe.

### LAPPULA

*Lappula echinata* Gilib. (stickseed), native to Eurasia, occurred as an adventive at Santa Monica in 1906 and at Upland in 1924, according to Munz (1935).

### LYCOPSIS

*Lycopsis arvensis* L. (small bugloss), a native of Europe, has been found at Upland in the San Bernardino Valley in 1917 and 1918, the only known occurrence in the state.

### MYOSOTIS

*Myosotis sylvatica* Hoffm. (forget-me-not), sparingly naturalized from Europe, has been found at San Anselmo, Mill Valley, Berkeley, and San Francisco. *M. versicolor* (Pers.) J. E. Smith (yellow and blue scorpion-grass), also an adventive from Europe, has been collected at Quincy and Eureka.

### SYMPHYTUM

*Symphytum asperrimum* L. (rough comfrey), a native of Europe, is adventive at Arcata.

## VERBENACEAE

### LIPPIA

*Lippia filiformis* Schrad. is listed by Munz (1935) as probably an escape from cultivation, occurring at San Diego, Los Angeles, and central California. It is a native of South America. The common lippias in California, *L. nodiflora* Michx. (mat-grass) and *L. lanceolata* Michx. (fog-fruit) are both natives.

### VERBENA

*Verbena bonariensis* L. is reported by Eastwood (1932*d*) as follows: "This verbena from Argentina has appeared in several localities in Cali-

fornia. It was first noted by Mr. J. W. Stacy between Alto and Mill Valley, in Marin County. . . . It has been collected also at Collinsville, Solano County, by Miss C. E. Smith, and along the Merced River between Snelling and the bridge, Merced County, by J. T. Howell." *V. hastata* L. (blue vervain), a native of the eastern states and the Mississippi Valley, has been found sparingly on the islands of the lower Sacramento River. *V. litoralis* HBK., from the American tropics, was collected at Clinton, Amador County, 1896, and on Bouldin Island, 1903. *V. officinalis* L. (European vervain), is an introduction from Europe and has been collected in the southern counties of California: at San Diego in 1884, at Oneonta in 1902, and at Riverside in 1917.

## LABIATAE

### LEONOTIS

*Leonotis Leonurus* R. Br. (lion's ear), a native of Africa, is reported by Munz (1935) as an "occasional escape from cultivation, as at Cardiff."

### LAMIUM

*Lamium amplexicaule* L. (dead nettle), from Europe, is occasionally found in California as a weed of gardens and cultivated fields. Greene (1894) records it from Sonoma County; Parish (1920) collected it from Claremont in 1918. Other localities are Riverside, San Bernardino, Ventura, Fort Bragg, St. Helena, Mt. Eden, Little Arthur Creek near Gilroy, and Columbia in Tuolumne County.

### MARRUBIUM

*Marrubium vulgare* L. (horehound), a European species, is recorded by Brewer and Watson (1876) and Bolander (1870) without discussion of its prevalence. Parish (1890-91), however, says that it "infests every roadside throughout the settled valleys of the southern counties, and extends well up the slopes of arid foothills." Jepson (1893) lists it from the lower Sacramento River; Davy (1898b) from Calaveras County. Today horehound is one of the commonest weeds in the state, found even in remote mountain pastures where few other introduced plants have yet arrived.

### MELISSA

*Melissa officinalis* L. (garden balm), a European introduction sometimes cultivated as a culinary herb, has been found as an escape in Marin County, at Santa Rosa, and at Guerneville.

### MENTHA

The introduced species of *Mentha* growing without cultivation in California are European. *Mentha citrata* Ehrb. (bergamot mint) was found

near San Bernardino in 1903, at Mecca in 1913, and on the banks of the Santa Ana River in 1907. Greene (1894) also reports it from Berkeley. *M. piperita* L. (peppermint), occasionally found in moist places, was reported by Davidson (1893) from Los Angeles and by Greene (1894) at Santa Rosa and on the islands of the lower San Joaquin, and it was noted by Davy (1896*b*) "as exceedingly abundant about Russian River Station and on both sides of the river at Guerneville." Munz (1935) cites it from Mesa Grande. *M. rotundifolia* L. (round-leaf mint) is local in the San Bernardino Valley and in the Los Angeles River bed. Early collections were made in 1896, at Los Angeles. *M. spicata* L. (spearmint) is fairly common in wet places about Berkeley, in the Napa Valley, and in Lake County. Parish (1890-91) reports it at San Bernardino: "It is beginning to be frequent by the side of ditches and on damp banks." Today it is plentiful in Scott Valley and in Napa Valley. *M. Pulegium* L. (pennyroyal), occurs in the lower San Joaquin Valley and in Sonoma and Marin counties. Davy (1896*b*) reported it as abundant at Russian River Station and on both sides of the river at Guerneville.

#### MOLUCCELLA

*Moluccella laevis* L. (shell-flower), adventive from Europe, thus far has been found only in the foothills of west Colusa County. Of this plant Dewey (1899) writes as follows:

In July of this year Mr. H. H. Chapman of Ashland, Oregon, sent to the U. S. D. A. a plant which was becoming a troublesome weed in that locality. He stated that it was first observed there about four years ago, and now it has taken possession of about 100 acres of the range. Stock do not eat it, and therefore it grows and produces seeds unmolested, while the nutritious grasses and other plants are kept down by grazing.

#### NEPETA

*Nepeta Cataria* L. (catnip), a native of Europe, is now fairly common in California. Parish (1890-91) reports that he first saw this plant in 1872, "growing abundantly near an old farmhouse at Edgar Canyon, in the San Bernardino Mountains." Other early collections were at Ager in 1887, Piru Creek in 1899, Scott Valley in 1892, and Lone Pine in the San Antonio Mountains, 1895. It is also recorded from the Russian River Valley, Lake County, Modoc County, Lake Glen, Riverside, and Claremont. *N. hederacea* (L.) Trev. (ground ivy), also an adventive from Europe, occurs on Bouldin Island along the lower Sacramento River.

#### PRUNELLA

*Prunella vulgaris* L. (selfheal) occurs sparingly in lawns throughout the state. The variety *lanceolata* Fer., the one common in California, is



recorded in the Russian collection from Sonoma County made in 1840-41 (Howell, 1937c). Brewer and Watson (1876) report it as abundant in Humboldt County. Self-heal is a native of Europe.

### STACHYS

Howell (1935c) reports *Stachys arvensis* L. (hedge nettle) as a "well-established garden weed" in Ross, Marin County. It is a native of Europe.

## SOLANACEAE

### DATURA

Specimens of *Datura* in the University of California herbarium labeled *D. Stramonium* are, according to Blakeslee, who has examined them, "almost certainly *D. ferox*, or hybrids of *D. Stramonium* and *D. ferox*." These were taken at Stockton, at Lathrop, and near Ione. An early collection was at Stockton in 1890, a later one at Colusa in 1925, more recent ones in Tehama County in 1938, near Bryte, Yolo County, and south of Cranmore in Sutter County, in 1939. The species is introduced from Southern Europe.

*Datura Stramonium* L. (Jimsonweed), a naturalized tropical plant of the Old World, although widely spread in the warmer parts of the state, is nowhere very abundant. Parish (1890-91) reports it as "recently introduced" at Santa Monica, and collected by Davidson in 1896 at Playa del Rey and Ballona.

*Datura Tatula* L. (purple thorn apple), a native of South America, is widely distributed but not abundant. Brewer and Watson (1876) report it from Siskiyou County. Parish (1890-91) traces its introduction "to the estimation in which its leaves are held as a remedy for asthma. More than twenty years ago a sufferer from this disease planted the seed near Kehl's Mill, and the plant still continues to propagate itself at that place. In that length of time it has spread over only about an acre of ground, and does not seem disposed to extend its limits, although the adjoining land is equally adapted to its growth." According to T. S. Brandegee (1893), *D. Tatula* is abundant in Lake County, especially about Upper Lake, and is not uncommon in Marin County. Munz (1935) records it near Claremont, and in San Dimas Canyon.

### LYCIUM

*Lycium halimifolium* Mill. (matrimony vine), a European ornamental, frequently escapes from cultivation. It has been reported as noxious in scattered locations from Modoc to San Diego counties. In 1903 it was collected at Beckwith in Sierra County, and Parish (1920) cites it as

an infrequent escape in the streets of San Bernardino in 1910 and 1919. Gander noticed it in 1934 in the bed of the Tijuana River about two miles from the mouth. *L. chinense* Mill., an east Asian species, is reported by Ball (1937) as an escape in Solano County.

#### NICOTIANA

*Nicotiana glauca* Graham (tree tobacco), according to Parish (1890–91), was probably introduced from Argentina into California during the Mission Period. In 1913 he observed plants at Mecca and at Calexico. It is not listed, however, by Brewer and Watson (1876). Today it is widespread in the warmer parts of the state.

#### PHYSALIS

*Physalis ixocarpa* Brot. (tomatillo) is an orchard weed, native to Mexico, which occurs especially in central and southern California. Parish (1920) regards it as “an early immigrant naturalized in gardens and orchards, less abundant now than formerly.” The Russian collection made in Sonoma County in 1840 and 1841 (Howell, 1937c) contains this species. It is found in San Benito County and the Ojai Valley; at Pomona, San Bernardino, Winchester, and elsewhere in the southern counties. *P. neomexicana* Rydb. (New Mexico husk tomato), a native of New Mexico and Colorado, has been collected at Elsinore. *P. pubescens* L. (husk tomato), an introduction from the southeastern United States, is less abundant in California than tomatillo. It has been collected at Needles, Fort Yuma, San Diego, and Visalia.

#### SALPICHROA

*Salpichroa rhomboidea* Meirs. (lily-of-the-valley vine) came originally from South America. In April, 1930, it was collected in San Luis Obispo County. According to Bellue (1935b), “during the past two years this weed has been submitted for identification from San Diego, Sacramento, San Joaquin, and San Francisco counties.” Ball (1937) reports it from Santa Cruz, Kern, and Los Angeles counties. E. Johnson reports it from Orange, 1936; Garden Grove, 1939; Talbert, 1939; Burbank, 1937; and from Ventura. Recently it has been abundant in Golden Gate Park, where it is spreading rapidly.

#### SOLANUM

The following introduced solanums occur in California: *Solanum nigrum* L. (black nightshade), *S. rostratum* Dunal (buffalo bur), *S. villosum* Willd. (hairy nightshade), *S. elaeagnifolium* Cav. (white horse nettle), *S. triflorum* Nutt. (cut-leaved nightshade), *S. sisymbriifolium*

Lam. (viscid nightshade), *S. carolinense* L. (Carolina horse nettle). Of these, *S. elaeagnifolium*, introduced from the Great Plains, promises to be of the greatest importance. Although none of these species are listed by Brewer and Watson (1876), *S. nigrum* is in the Russian collection made in 1840-41 (Howell, 1937c), and is cited by Bolander (1870) near San Francisco. Torrey (1856) found it about San Francisco Bay in 1832-41. Parish (1890-91) says that it occurred at Santa Monica but was "not abundant," adding "This is the second station in Los Angeles and in the state, and marks its gradual increase." Black nightshade is naturalized from Europe. It was found at Riverside in 1906, Santa Ana in 1914, and at El Monte, Upland, and Laguna Canyon in 1918. Munz (1935) cites other localities: San Bernardino and Cushenbury. Today, though occurring here and there in the warmer parts of the state, it is nowhere very abundant.

*Solanum elaeagnifolium* is first mentioned by Davy (1896a) in a report on specimens from James E. Hughes of Fresno, on whose ranch the weed was introduced "some eight years ago, during which it has spread over five acres of land, and is now beyond control." Davy received another specimen from Traver, Tulare County, the sender explaining "It seems to have started from seed swept from a grain car at one of our warehouses here, where it is growing and spreading considerably." Davy adds that the California Academy of Sciences possesses a specimen collected by D. Waitt near Riverside, in May, 1884. According to Parish (1890-91) this species is "well established by the roadsides at South Riverside." By 1897 it had become fairly common along railroad tracks in southern California, at Corona, Compton, San Pedro, Riverside, Ocean-side, and Ventura. Parish (1913) records the species in the Imperial Valley, but makes no mention of *S. rostratum*. Infestations were reported at Niland, 1913; Chino, 1918; and San Diego, 1919. Today, *S. elaeagnifolium* is distributed throughout the San Joaquin Valley, with rather heavy infestations in Kern County particularly, and with small and scattered infestations in San Diego, Orange, Los Angeles, San Bernardino, Riverside, and Ventura counties and in the Sacramento Valley.

Parish (1890-91) reports that *Solanum rostratum* "has obtained at least a start at the salt works in Los Angeles County where it was collected some six years ago." It is gradually extending its range in the state, although nowhere abundant. Since its introduction about 1884, *S. rostratum* has been noted as a casual at Mentone in 1911, and at Upland in 1918. Today it may be found locally in the Sacramento and San Joaquin valleys and Yreka. This solanum is introduced from the Great Plains. *S. villosum*, which closely resembles *S. nigrum*, has been found

at Santa Monica, Oxnard, Los Angeles, Claremont, and Upland. It is adventive from Europe. *S. triflorum*, from the eastern United States, has been found at Claremont. *S. sisymbriifolium*, a native of tropical America, was collected, according to Munz (1935), "at San Marcos Pass, Santa Barbara County, by C. Dudley, in 1930." E. Johnson reports finding *S. carolinense* L., a native of the southern states, in 1927 at Center School in Ventura County, and in 1935 Munz collected it in Orange County. E. Johnson collected specimens on the Bonanza Ranch in Yuba County in 1924, the Irvine Ranch in Orange County in 1935, and Ball (1937) cites an infestation near Marysville.

## SCROPHULARIACEAE

### ANTIRRHINUM

*Antirrhinum Orontium* L., (lesser snapdragon), a plant which behaves as a weed in Eurasia and Mediterranean regions, is reported by Howell (1940b) as occurring about ten miles north of Santa Cruz.

### BELLARDIA

*Bellardia Trixago* All. is a naturalized plant from Europe which Jepson (1923-25) reports in old fields near Pacheco, East Oakland, Berkeley, and Napa; it has also been collected on Mt. Diablo.

### DIGITALIS

*Digitalis purpurea* L. (foxglove), a European garden plant, is naturalized on the Humboldt and Mendocino coasts.

### LINARIA

*Linaria Elatine* (L.) Miller (sharp-pointed toadflax), an Old World species, is reported by Munz (1935) from Wintersberg, Orange County. Specimens have been sent in from near Wheatland, where it is infesting alfalfa, and from Yolo, Napa, Solano, and Placer counties.

Concerning *Linaria reticulata* Desf. var. *aurea-purpurea*, Eastwood (1899) reports:

The students in the high school at Santa Maria, have sent to the herbarium of the Academy of Sciences, specimens. . . They found this showy species abundant in the cultivated fields around Santa Maria and apparently spreading rapidly. This marks probably the introduction of a new weed, a native of Portugal, and perhaps an escape from the garden of some Portuguese.

*Linaria spuria* Mill. (rough-leaved toadflax), an adventive from Europe, occurs sparingly in California, chiefly in the south. It has been found at Menlo Park, near Coulterville, Mariposa County, and at Ojai.

*Linaria vulgaris* Mill. (butter-and-eggs), from Europe, was early collected in Sonoma County in 1884 and also at Upland in 1916.



## PARENTUCELLIA

*Parentucellia viscosa* (L.) Cav., from southern Europe, is reported by Jepson (1923-25) as occurring in valley lands from Arcata to Blue Lakes in Humboldt County.

## VERBASCUM

There are three species of *Verbascum* in California, all introductions from Europe: *Verbascum Thapsus* L. (common mullein), *V. virgatum* Stokes (virgate mullein), and *V. Blattaria* L. (moth mullein).

According to Parish (1890-91), "*Verbascum virgatum* not elsewhere known in the United States, occupies a limited region near Pasadena. . . . It is to be found at the old Dalton Ranch and in abundance under open groves of oaks on the hills about Lamanda Park, where it often attains a height of six feet. Its introduction was probably by way of Mexico, and during Mexican rule." Parish further reports that this species was collected by Cleveland in Lake County, 1882, and along the Sacramento River by Baker and Nutting in 1894. K. Brandegee (1901) says: "*V. virgatum* I saw first near Pasadena in the year 1885, but I had observed *V. Blattaria* L. not far from Stockton in 1876." It is recorded by Jepson (1923-25) near Los Angeles at Alhambra, Eagle Rock, Pomona, Sierra Madre, and El Monte.

*Verbascum Thapsus*, according to Parish (1920) is reported from near Colton in 1906 and from Riverside in 1918. K. Brandegee (1901) records:

The great or woolly mullein, *V. Thapsus* L., noted in Bot. Cal. ii, 472, as having been found in Siskiyou County by Mr. Greene, has been known to me since 1854. It was then sufficiently common in fields of Sacramento County near the prosperous mining town of Prairie City, of which no vestige now remains. In the year 1859, it covered a tract several hundred feet in length along the American River, between Folsom and the place where the Branch State Prison now stands.

Today it is common in the Sierra Nevada pine belt and in the north coast ranges.

T. S. Brandegee (1893) states:

*Verbascum Blattaria* L. has long been abundant in California. It is found in the foothills above Sacramento; along the San Joaquin, especially about Robert's Island; in Lake County, and even on Redwood Peak, back of Oakland. Specimens are also in the herbarium of the Academy of Sciences from Sisson, collected by Dr. Palmer, and from Big Meadows, collected by J. G. Lemmon, in 1880.

## VERONICA

Two introduced species of *Veronica*, both from Europe, are growing without cultivation in California. *Veronica arvensis* L. (corn speedwell),

an escape from gardens, now occurs in Humboldt County, Siskiyou County, and in several localities in southern California. *V. Buxbaumii* Tenore (Byzantine speedwell), another escape, is found occasionally in lawns in southern California; also in the Eel River Valley, at Woodland, and at Davis. Parish (1920) cites an early collection at Los Angeles in 1896.

## MARTYNIACEAE

### PROBOSCIDEA

*Proboscidea louisiana* Woot. & Stand. (unicorn plant), native of the Mississippi Valley, south to New Mexico, was early collected in 1914 at Chico; later records are from Porterville, Soquel in Santa Cruz County, Martinez, Elsinore near Palm Springs, Keene in Kern County, Meinert in Ignacio Valley, Sacramento Valley, and at Otai Mesa in San Diego County. In the last-named location it is usually associated with Texas blueweed (*Helianthus ciliaris*).

## PLANTAGINACEAE

### PLANTAGO

In California there are six introduced species of *Plantago*, as follows: *Plantago major* L. (common plantain), *P. lanceolata* L. (buckhorn plantain), *P. Coronopus* L. (crowfoot plantain), *P. Psyllium* L. (flaxseed plantain), *P. pusilla* Nutt. (slender plantain), and *P. arenaria* Waldst. & Kit. (sand plantain). Brewer and Watson (1876) say that *P. major* is found from "San Diego to Oregon; apparently sparingly naturalized in California"; and of *P. lanceolata* in "dry fields, near San Francisco; introduced from Europe; apparently not widely established." According to Parish (1899), *P. lanceolata* was first seen at San Bernardino in 1881. Davidson (1893) reports it from Los Angeles. Hilgard (1890), having mentioned that *P. major* gives "some trouble in lawns and irrigated grounds, but cannot be considered troublesome," goes on to say: "It was quite otherwise with *P. lanceolata*, which in company with *Setaria glauca*, is the most formidable enemy of the irrigated grounds and pastures in the foothills of the Sierra, and more or less in the adjacent portions of the Sacramento Valley. This plantain frequently shares the ground evenly with grain, and, in company with *Setaria*, forms steadily increasing patches in alfalfa fields, until the whole ground is taken." Eastwood (1898) cites both *P. major* and *P. lanceolata* from San Francisco. The latter is mentioned by Davy (1898b) as one of the introduced plants around Murphy's Camp in Calaveras County. *P. Coronopus* was reported collected on Catalina Island in 1895, and at Pebble Beach in 1916. Munz (1935) reports *P. Psyllium*

as an adventive at Claremont and the San Bernardino Mountains, *P. pusilla*, found in western San Diego County, is considered an introduction from the Atlantic Coast. *P. arenaria*, an adventive from central Europe and Asia Minor, common in limited areas in Ohio and Pennsylvania, has been collected at Berkeley and San Francisco in 1935, and at Riverside in 1937.

## RUBIACEAE

### GALIUM

*Galium Aparine* L. (bedstraw), supposedly an introduction from Europe, is fairly well distributed throughout the state from 100 to 4,500 feet elevation. *G. parisiense* L. (wall galium), native to Europe, has been introduced into Sonoma, Humboldt, and El Dorado counties. *G. murale* DC., an introduction, probably from Spain, was collected by Stacey (1933) about two miles from Stanford University. *G. tricornes* Stokes (corn galium), also European, occurs in grain fields of Sonoma and Mariposa counties.

### SHERARDIA

*Sherardia arvensis* L. (field madder), certainly European, has become naturalized in pasture lands near the coast, chiefly from Marin County to San Mateo County. Greene (1891) notes of it: "Vicinity of Berkeley; first found by Blake in 1889." Parish (1920) records it in San Bernardino in 1913 but adds that it is not persisting. It was collected at Los Angeles in 1914. Other localities are Eureka, 1899; Redwood Ridge in Alameda County, Rutherford, Mendocino, 1898; Hydesville, Pilarcitos Lake and Canyon in San Mateo County, 1893; Inverness, and in Alameda County, 1893; and San Gabriel.

## CAPRIFOLIACEAE

### LONICERA

Parish (1920) reports *Lonicera japonica* Thunb. (Japanese honeysuckle), a native of Japan, as "an occasional fugitive, and as becoming naturalized, in damp thickets" in the San Bernardino Valley, in 1910.

## DIPSACEAE

### DIPSACUS

*Dipsacus fullonum* L. (fuller's teasel), a European plant, has become established in California, especially near the coast, in low waste places, vacant lots, and pasture lands. As long ago as 1876, according to Parish (1920), Cleveland collected the species in the Cajon Valley, San Diego County, where it is still growing. In 1890 and 1893 it was collected at Los Angeles. Hilgard (1890) lists it.

*Dipsacus sylvestris* Huds. (wild teasel) was first reported by K. Brandegee (1892a) as a naturalized plant of San Francisco growing near the Presidio, where it still flourishes but has not spread. It was also collected at Sisson, Shasta County, in 1912. It is a native of Europe.

#### SCABIOSA

*Scabiosa atropurpurea* L. (sweet scabious), native to the Mediterranean region, is now found in the Sacramento and Napa valleys, in Alameda County, and in San Bernardino County. Vasilit (1890) notes it was "becoming naturalized in the mountains north of Pescadero, also in lowlands along the San Joaquin." Jepson (1893) reports it as spontaneous in uncultivated places near Fairfield. *S. stellata* L. (scabiosa), also native to the Mediterranean, was collected, according to Parish (1920), at Altadena by McClatchie in 1893. It is a rare escape.

#### VALERIANACEAE

##### CENTRANTHUS

Munz (1935) reports *Centranthus ruber* DC. (red valerian), a European garden plant, as an escape at San Dimas. Ewan (1939) cites the collection of this species in the vicinity of Ione, Amador County, June, 1904. He ventures the opinion that "it seems to belong to the considerable group of adventives which cannot persist long in the competitive ranks and will, accordingly, never become a pestiferous weed."

##### VALERIANELLA

*Valerianella carinata* Loiseleur, an Old World species, was collected in 1938, on the banks of Jackson Creek, three miles northeast of Jackson. *V. olitoria* (L.) Dufr. (corn salad), also from the Old World, was collected in 1932, on the banks of the Consumnes River, from Ione to Latrobe, Amador County; and on Jackson Creek in 1938. It has also been found in Siskiyou County.

#### COMPOSITAE

##### ANTHEMIS

There are two species of *Anthemis* in California, *Anthemis Cotula* L. (mayweed) and *A. nobilis* L. (garden camomile), both European introductions. Although Brewer and Watson (1876) report *A. Cotula* "as sparingly found along roadsides; introduced but not yet common," the species was apparently a very early introduction, and fairly abundant from the sixties on. K. Brandegee (1891) recalls "going to school through blossoming fields of such a robust growth as almost in turns of



the pathway to hide me from my companions. This was in 1854 at the village of Prairie City near the eastern line of Sacramento County." Parish (1890-91) reports the species as rare at San Bernardino in 1880, but abundant at the time of his report. Hilgard (1890) first saw the plant along the roadsides between Oakland and Berkeley in 1880; it was "not yet widely diffused" in the Bay region in 1890. According to Parish (1890-91) it entered the coast regions as early as 1882, and by 1890 was abundant on the hill pasture lands. Today mayweed is widely distributed at lower altitudes. *A. nobilis* is thus far found as an escape only at Fort Bragg.

#### ARCTIUM

*Arctium Lappa* L. (great burdock), a native of Europe, is sparingly introduced in California—at Livermore, Niles, Aromas in San Benito County, Carmel Valley, and Riverside, where, according to Parish (1920), Reed reported it in 1907 as establishing itself near a deserted garden. It was collected near Ferndale in 1899. *A. minus* Schk. (common burdock), a native of Europe, is found on the bottom lands of the Eel River near Humboldt Bay, in Kings County, and at San Francisco.

#### ARCTOTIS

*Arctotis stoechadifolia* Berg. (African daisy) is a native of South Africa, and common in flower gardens. Gander, in correspondence, reports it as spreading near San Diego.

#### ARTEMISIA

*Artemisia biennis* Willd. (biennial wormwood), a European introduction, is reported by Parish (1890-91) from near Santa Ana in 1882. Collections were made at Los Angeles in 1893; at Santa Barbara in 1896; and at Victorville in 1915. Jepson (1923-25) gives its distribution as the lower Sacramento River, West Berkeley, Palo Alto, and Laguna in Orange County.

#### BELLIS

The only alien of this genus occurring in California is *Bellis perennis* L. (English daisy), a native of Europe, grown as an ornamental, which now and then escapes. Davidson (1893) reports it at Los Angeles in 1892; and Greene (1894) records it in the San Francisco Bay region, "escaped from gardens, and naturalized in the seaboard counties from at least Marin northward." Drew (1889) reports it as naturalized about Arcata.

#### BIDENS

The introduced species of *Bidens* in California are *Bidens frondosa* L. (beggar-ticks), from the eastern United States, and *B. pilosa* L. (hairy

bur marigold), a native of the tropics. Brewer and Watson (1876) say of *B. pilosa*: "Santa Barbara to Los Angeles, near water courses, etc. A weed widely diffused over the warmer coasts, especially of the Pacific; if correctly identified with *B. pilosa*, doubtless introduced with cattle into California." Although Parish (1890-91) lists it among the naturalized plants of the four southern counties, a survey of the Imperial Valley in 1913 showed it absent. Hilgard (1890) does not report either species. Today *B. pilosa* occurs in coastal southern California north to San Luis Obispo County. *B. frondosa* was collected in 1916 and 1917 at Los Angeles and at Lake Arrowhead, where it is now sparingly distributed. Today it is found mainly in the San Joaquin and Sacramento valleys.

#### CARTHAMUS

*Carthamus lanatus* L. (distaff thistle), a native of the Mediterranean region, adventive at San Francisco and Stockton, is reported by Ball (1937) as occurring near Santa Ana and as "displaying vigorous and spreading habit in a canyon near San Luis Obispo." E. Johnson, in correspondence, reports its occurrence in 1937 at Olinda in Orange County. *C. nitidus* Boiss., from Syria, has been collected at San Luis Obispo and at Sonora and Jacksonville in Tuolumne County. *C. tinctorius* L. (safflower), native to those parts of Asia and Africa bordering the Mediterranean, was found, according to Munz (1935) in the Antelope Valley in 1929. It occurs as an escape in Kings, Sacramento, San Joaquin, Tulare, and San Benito counties.

#### CENTAUREA

There occur in California the following species of *Centaurea*, all natives of the Old World: *Centaurea melitensis* L. (Napa thistle), *C. solstitialis* L. (yellow star thistle), *C. Calcitrapa* L. (purple star thistle), *C. salmantica* L. (escobilla), *C. sicula* L. (Sicilian thistle), *C. Cyanus* L. (cornflower), *C. iberica* Trevir (Iberian thistle), and *C. repens* L. (Russian knapweed).

The most widespread of the species of *Centaurea* in California are *C. melitensis*, *C. solstitialis*, *C. Calcitrapa*, and *C. repens*. The first two are annuals; the last two perennials.

Hendry and Bellue (1925) show that *C. melitensis* occurred in Alta California during the Mission Period. Seeds were found in the adobe bricks of buildings as follows: San Fernando Rey de Espano, San Fernando (1797), and Rancho La Natividad, Salinas (1837). These early records refute the common statement that the weed was first introduced at Napa. It was apparently the first star thistle to invade the state. Although Parish (1920) names, as the earliest collection, that of F.

Guirardo in 1861, Torrey (1856) collected it at San Rafael between 1838–1842. Brewer and Watson (1876) say of *C. melitensis*, “Old fields and waste grounds; common on the western borders of the state”; and of *C. solstitialis*, “Fields, Oakland (Bolander), San Diego (Palmer), and probably elsewhere along the coast. Bolander (1870) records both of these species near San Francisco. Hilgard (1890) says: “Broadly speaking, there are six chief introduced species that give serious trouble, to wit: First, and worst of all, are *C. melitensis* and *C. solstitialis*, introduced from Southern Europe, and almost universally diffused under a variety of names.” Parish (1890–91), who reports *C. solstitialis* at San Diego, pronounces it “common and probably destined to become as universally diffused as its ally *C. melitensis*.” Davidson (1893) refers to *C. melitensis* in Los Angeles County as threatening to become an injurious weed. Greene (1893a) found both species on the summit of Mount Hamilton. Jepson (1893) lists *C. melitensis* in the lower Sacramento region. According to a note in *Erythea* (1897), Mr. W. R. Mumma writes that *C. solstitialis* was first seen near Grand Island, Colusa County, about 1879, but that he could not learn whence or how it came there. Davy (1898c) reports that *C. solstitialis* has found its way into Alameda County. E. Johnson, in correspondence, reports it from a number of localities in San Diego, Orange, Riverside, San Bernardino, Los Angeles, and Ventura counties. Davy (1902) finds *C. melitensis* common and troublesome on ranges near Ukiah. On the stock ranges of north-western California, after invasion of the native grassland associations by wild oat, by *Erodium*, and then by barley grass, squirreltail, and soft chess, he sees a third immigration taking place, among the invaders being *C. melitensis*, “destined to cause irreparable injury to the ranges unless kept in check and prevented from becoming firmly established.” This prophecy of Davy has been abundantly fulfilled.

With regard to the purple star thistle, *Centaurea Calcitrapa*, Parish (1890–91) states that “in 1886, Professor Greene detected near Vacaville one of the Old World star thistles, *C. Calcitrapa*. It has since spread a short distance along country roads and over uncultivated plots of ground. It is not known from any other station in North America except as a ballast weed at Atlantic seaports.” It was collected by Jepson at Vacaville in August, 1887. Eastwood (1896g) mentions finding it not far from San Mateo, on the road to Crystal Springs Lake: “At present there are but two or three plants, but it is likely to spread, as *C. melitensis* and *C. solstitialis* have done.” Today purple star thistle is particularly abundant in Solano County, the probable seat of its first introduction, and is gradually spreading along lines of travel, encroach-

ing laterally in uncultivated lands. Besides occurring about San Jose and in San Mateo and Yolo counties, it has recently been found in San Luis Obispo County and as far south as San Diego.

*Centaurea salmantica* thus far has a very limited distribution, having been found only near Healdsburg. *C. sicula* occurs only at Alder Creek near Folsom, where it was first noticed in 1923. *C. Cyanus*, reported by Parish (1920) in 1904 as a garden escape at Los Angeles, now grows in Orange County, Scott Valley in Siskiyou County, Holmes Flat on the Eel River, Oakland, and Quincy.

*Centaurea iberica*, native to Asia Minor, is now established in three widely separated localities in California. It was first noted in 1923 by E. Johnson near Solvang, Santa Ynez Canyon, Santa Barbara County. In 1929 it was collected near Santa Rosa, where, by 1932, it covered about 20 acres. In 1932, two infestations were reported in San Diego County, one approximately 80 acres in extent.

*Centaurea repens*, the Russian knapweed, now regarded as a major noxious weed of California, has become well established throughout the warmer sections—in cultivated fields, in orchards, and along roadsides and ditchbanks. It was introduced between 1910 and 1914 in impure Turkestan alfalfa seed and also probably in sugar-beet seed. Parish (1920) reports "a few scattering plants in 1919 in a field of sugar beets on the farm of Mr. A. Decker, at Artesia, Los Angeles County, 2-3 feet high, and seeding abundantly. It is already spreading in both cultivated and uncultivated ground and proves difficult to eradicate by reason of its perennial rootstocks. Not elsewhere reported from the United States." E. Johnson, in correspondence, gives records of its occurrence now in a number of localities in Imperial, San Diego, Orange, Riverside, San Bernardino, Los Angeles, Ventura, and Santa Barbara counties. Its present spread here is probably due to movements of seeds, feedstuffs, and the like, inasmuch as no Turkestan alfalfa seed has been imported into California from foreign countries since 1914.

#### CHRYSANTHEMUM

*Chrysanthemum carinatum* L. (tricolor chrysanthemum), a native of Morocco, is reported by Munz (1935) as growing uncultivated near San Diego.

*Chrysanthemum coronarium* L. (garland chrysanthemum), a native of the Mediterranean, is, according to Parish (1920), a recent introduction "naturalized along railway tracks and elsewhere in San Diego. . . . Not elsewhere known from the state." Later it was collected three miles west of Hawthorne in Los Angeles County.



*Chrysanthemum Leucanthemum* L. (oxeye daisy), also a native of Europe, is recorded by Jepson (1923-25) at Eureka, Sisson, and Crescent City, and by Keck (1933) at Quincy.

*Chrysanthemum Parthenium* (L.) Pers. (feverfew), an Old World species, is described by Keck (1933) as "sparingly established north of Spanish Creek, near Quincy, well away from human habitations." It also has been collected in Diablo Canyon, in San Luis Obispo County, on the north side of Mt. Shasta, and at the Alta Loma Ranch, Napa County.

*Chrysanthemum segetum* L. (corn chrysanthemum), a naturalized plant from Europe, is reported by Jepson (1923-25) from Berkeley, Caspar, and Mendocino City. Collections have also been made at Santa Rosa, Fort Bragg, and Hydesville. In pasture lands it is becoming a pest.

#### CICHORIUM

*Cichorium Intybus* L. (chicory), a garden plant, introduced from Europe, has become naturalized throughout the state at lower altitudes. Though not listed by Bolander (1870) among the plants about San Francisco, it is reported by Brewer and Watson (1876) from Santa Barbara. Hilgard (1890) records it. According to Leeds (1891), chicory "last year appeared upon the footways of the Alameda, . . . the broad drive connecting Santa Clara and San Jose, and this summer I find a group of it just beyond the northwest corner of Santa Clara, on the San Francisco road." It was recorded at San Bernardino, 1895; at Sherman, 1902; at San Diego, 1904; at Riverside, 1905; at Rialto, 1906; and at Upland, 1918. Today the species is widespread in the Sacramento and Napa valleys, besides occurring at Eureka and in the localities cited above.

#### CIRSIIUM

Dewey states that *Cirsium arvense* Scop. (Canada thistle) "is reported to have been found about the residences of French missionaries in Canada early in the seventeenth century. There is a tradition that it was purposely introduced into Canada by the French for feeding swine; but there appears to be no just ground for this tradition. . . . It is said to have been introduced into eastern New York with the hay and camp equipage of Burgoyne's army in 1777."

The earliest record in California is that of Rattan (1879*a*), at Humboldt Bay. Drew (1889) states that the weed was "introduced at Arcata some six years ago and has become firmly established." The chief infestations today are in the northwest counties.

The first California act aimed at any noxious weed—that of March 2,

1872—applied to Canada thistle in Humboldt, Siskiyou, Del Norte, and Alameda counties. Probably, therefore, the spread from the first infestations started during the decade 1870–1880 and proceeded so rapidly as to alarm the land owners. The act made it unlawful “to permit seed to ripen or to be scattered abroad, or to knowingly sell any seed or grain containing thistle seed.” K. Brandegee (1892*a*) collected the weed at San Francisco in 1892. Parish (1920) states that it was locally well established in the peat lands about Wintersberg, Orange County, in 1917. That same year Newman (1917*b*) records infestations in Humboldt, Lake, and Orange counties: “The state commission of horticulture has been directing attention to one of these areas of infestation for the last two years; the other two have only recently been reported.” Leeds (1891), Hilgard (1890), and Davy (1902) do not mention Canada thistle. Jepson (1923–25) gives its present distribution as “lower Eel River at Ferndale; Yreka; Quincy; Truckee; Los Angeles, San Bernardino, and Orange counties.” Infestations also occur in Lassen, Siskiyou, and Sacramento counties.

*Cirsium fontinale* (Greene) Jepson, thus far collected only at Crystal Springs in San Mateo County, is regarded by Jepson (1923–25) as a probable introduction.

*Cirsium lanceolatum* (L.) Hill (bull thistle), native to Europe and Asia, is fairly common at lower altitudes in California, especially in the northern part. Jepson (1923–25) records it from Berkeley, Stockton, Suisun, Ione, Quincy, Prattville, Eureka, and Yreka; Munz (1935) from Hidden Valley in Ventura County; and E. Johnson, in correspondence, from Artesia, East Long Beach, and Bellflower in Los Angeles County, and from Potrero Valley in Ventura County.

*Cirsium pycnocephalus* L. (Italian thistle) is erroneously referred to by Howell (1932) as *C. neglectus*. He says that it was “first found in 1912 at Fort Bragg by Miss Eastwood, and later on the Marina, San Francisco, by Dr. E. Goodman in 1920, and by Miss Eastwood in 1922. In 1930, collections were made from a flourishing stand in the Berkeley Hills by Mr. J. T. Howell.” In this latter situation the weed is spreading rapidly. It also occurs in Sonoma County. Very recently rather extensive infestations have been found in Marin County. It is a native of the Mediterranean region.

*Cirsium tenuiflorus* Curt., according to Howell (1939*c*), is a species distinct from *C. pycnocephalus*, with which it has been formerly confused. It is widespread through central Europe, and now occurs as an introduction in Humboldt, Mendocino, Marin, San Francisco, San Mateo, Santa Clara, Contra Costa, Alameda, and San Benito counties.

## CNICUS

*Cnicus benedictus* L. (blessed thistle), naturalized from Europe, is becoming distributed throughout the Sacramento Valley and at certain points in the hills bordering. Brewer and Watson (1876) list it as common near Healdsburg. According to Davidson (1893), it is casual in Los Angeles. Jepson (1923-25) records it from Petaluma, Lathrop, Buena Vista in Nevada County, and Oroville. Specimens have also come from Bakersfield, from Rosemead, and—in San Diego County—from Encinitas, Jamacha, and Glen Lonely.

## COREOPSIS

*Coreopsis tinctoria* Nutt. (golden coreopsis), a garden plant of the central United States, occurs as an escape at Redding and Kaweah.

## COTULA

The two species of *Cotula* in California are both aliens: *Cotula australis* Hook. (Australian brass buttons) and *C. coronopifolia* L. (common brass buttons) from South Africa. Brewer and Watson (1876) cite both species: *C. australis*, "waste places. . . . Probably a waif from Australia or New Zealand, where it abounds"; and *C. coronopifolia*, "wet places around San Francisco Bay." Bolander (1870) lists the latter species only in the vicinity of San Francisco; and Behr (1891) states in his *Botanical Reminiscences* that it appeared there first between 1851-1854. *C. australis* was collected at San Diego in 1882; Los Angeles and Pasadena in 1905; San Bernardino, 1911; Ontario, 1918. Today it occurs chiefly in the streets of towns and cities from San Diego to Eureka. *C. coronopifolia* has approximately the same geographical distribution.

## CREPIS

*Crepis bursifolia* L., a native of southern France and Italy, occurs in lawns and waste places. It is well established on the campus of the University of California at Berkeley.

*Crepis capillaris* (L.) Wallr. (smooth hawksbeard), an adventive from southern and middle Europe, is gradually enlarging its area. Davidson (1896) lists it from Big Rock Creek, San Gabriel Mountains; Parish (1920) as a naturalized plant in the streets of Santa Barbara; Jepson (1923-25) from Eureka, Berkeley, and Hetch-Hetchy.

*Crepis rubra* L., also native to Italy and the Balkans is reported only once from California—at Belvedere, Marin County.

*Crepis vesicaria* L. subsp. *taraxacifolia* (Thuill.) Thell., a native of

western Europe and northwestern Africa, occurs on the Mendocino coast and at Berkeley; also near Los Angeles, where it was collected in 1893.

#### CYNARA

*Cynara Cardunculus* L. (artichoke thistle) was introduced near Benicia about 1880, probably from southern Europe, where it is used as a food. Escaping from gardens, it spread over some 70,000 acres in and around Benicia and Cordelia. The heaviest infestation, 4,000 acres, was in the hills near Benicia. Scatterings also occur in Contra Costa, San Joaquin, Alameda, Orange, and San Bernardino counties. Parish (1899) calls it "abundant and well established over a hillside pasture at Trujillo's Ranch, on the road from Rincon to Smith's Mountains, San Diego County, June, 1897." A program of eradication instituted several years ago by Napa County and the State Department of Agriculture has greatly reduced the area infested in that county.

*Cynara Scolymus* L. (artichoke), another European garden plant, occasionally escapes from cultivation. Parish (1920) reports it as "abundant over a hillside pasture near Rincon, San Diego County" in 1897; and in 1889 he found a few plants by a roadside at San Bernardino. It also was collected at Laguna, Murrieta, and Orange in 1918.

#### ECLIPTA

*Eclipta alba* Hassk. (false daisy), introduced from tropical America, has been found on the shores of islands in the lower Sacramento River, at Imperial, El Centro, and Laguna Ranch south of Los Angeles, and, according to Munz (1935) at Puddingstone Dam near San Dimas. It has been collected at Chula Vista. Parish (1913) described it as among the commonest weeds of the Imperial Valley, which it entered through the irrigation system.

#### ERECTITES

*Erechtites arguta* DC. (New Zealand fireweed), from New Zealand or Australia, has been found in redwood forests from Mendocino County to Del Norte. *E. prenanthoides* DC. (Australian fireweed), also a native of Australia, was brought into Humboldt County in 1918 and has since spread rapidly.

#### ERIGERON

*Erigeron linifolius* Willd. (flax-leaved fleabane), naturalized from the American tropics, is found chiefly in southern California and a few localities farther north. Eastwood (1896c) reports collecting it at Bakersfield in 1893, at Santa Barbara in 1896; it then was regarded as a new weed in the Bay region. Jepson (1923-25) records it from Oakland,



Pasadena, Redlands, and San Diego. It is also known at Riverside and is common near Patterson in the San Joaquin Valley. Gander has collections from several localities in San Diego County.

*Erigeron annuus* Pers. (annual fleabane), from the eastern United States, is found sparingly in Humboldt County. *E. canadensis* L. (horseweed), a common native of the eastern states, was probably an early immigrant, judging from its present wide distribution in the state along roadsides, ditchbanks, in cultivated fields, and waste places. It is cited by Brewer and Watson (1876); also by Hilgard (1890) and Davy (1898a) at Honey Lake.

*Erigeron ramosus* (Walt.) B.S.P. (daisy fleabane), also naturalized from the eastern United States, has been found in Humboldt and Plumas counties and in the Yosemite Valley.

### EUPATORIUM

A native of Mexico, *Eupatorium adenophorum* Spreng. (white thoroughwort) is recorded by Munz (1935) as a "rare escape in canyons (Monrovia, Pasadena, Santa Barbara); Berkeley." It has been collected at Sweetwater Dam in San Diego County by Gander.

### FILAGO

*Filago gallica* L., naturalized from Europe, occurs, according to Jepson (1923-25) in the Napa Range; at Hydesville in Humboldt County; and at Ione, Milton, and Whiteside in Mariposa County.

### GALINSOGA

An introduction from South America, *Galinsoga parviflora* Cav. (galinsoga) occurs sparingly in southern California, where it was collected at Vernon in 1902. Other collections have been made at The Laguna in the Laguna Mountains, at San Gabriel, Pomona, Altadena, and Monrovia.

### GNAPHALIUM

*Gnaphalium spathulatum* Lam. (spathulate cudweed), an Old World species, is a common weed in southern California, where, according to Munz (1935), it has been found at Upland, Claremont, and San Diego.

J. T. Howell (1937a) reports three additional adventive species of *Gnaphalium* in California. Of the first, *Gnaphalium luteo-album* L., he says, "Observations have shown it to be one of the common weeds of the San Francisco Peninsula in Santa Clara, San Mateo, and San Francisco counties." Collections have also come from the San Joaquin Valley, where it has been found in alfalfa fields and along irrigation ditches;

and also from southern California—the Rancho Santa Ana Botanic Garden in Orange County. The second species, *G. japonicum* Thunb., has been collected at several stations in Humboldt County and as far east as Sharber Slough on the Trinity River. The earliest recorded collection in the state was in 1915. It is an Australasian species from Tasmania and New Zealand to Japan. The third species, *G. collinum* Labill., from Australia, has become established in northwestern California. It was found as long ago as 1904 at Eureka and has since been collected northward along the coast to southern Del Norte County and eastward to the vicinity of Korb, Humboldt County.

### HEDYPNOIS

*Hedypnois cretica* Willd., a native of Asia Minor, has been reported from a few California localities—Penn Valley, hills between Santa Rosa and Calistoga, Nevada County, the Oroville foothills, Atwater, Hornitos, Los Angeles, and San Diego. Eastwood (1900a) found it in abundance in Sonoma County, “growing along the roadside, in the fields and near the flume that brings water to the Sanitarium. This was in April of the present year. . . . I have been told that where the Sanitarium now stands there was at one time a large garden worked by the Italians. It was doubtless through them that the weed was introduced.” It was collected at Mariposa in 1895, Los Angeles in 1905, and San Diego in 1906.

### HELIANTHUS

The introduced species of *Helianthus* in California are *Helianthus annuus* L. (common sunflower), and *H. ciliaris* DC. (Texas blueweed). The former, now common throughout the state, was introduced from the Great Plains; the latter from the southwest—western Texas, Oklahoma, New Mexico, Arizona, and southward.

*Helianthus annuus* is mentioned by Brewer and Watson (1876) and by Hilgard (1890), and has subsequently been collected at many widely scattered localities.

*Helianthus ciliaris* in California was first noticed at Monterey Park, Los Angeles County, in 1932. In 1933 an infestation was discovered in Tehama County on the Southern Pacific right-of-way 3½ miles south of Red Bluff. In 1934 a third site was recorded from San Luis Obispo County; and in July, 1936, it had gained a foothold in Wheeler Canyon in Ventura County. Later, in December, 1936, an infestation was reported in an orange orchard near Brea, Orange County. In addition to the above locations, E. Johnson reports in 1938 infestations at Loftus in Orange County, at Chino in San Bernardino County, and at Santa Fe

Springs in Los Angeles County, at El Segundo in 1932, at Monterey Park and Otterbein in 1936, and at Ventura and Santa Paula in Ventura County (date not given).

### HYPOCHOERIS

*Hypochoeris glabra* L. (smooth cat's-ear), an introduced European weed, is widely distributed in cultivated fields and pasture lands. Brewer and Watson (1876) report it in fields near San Francisco and Santa Cruz; Bolander (1870) also near San Francisco. Greene (1894) says it is very common in all open grounds in the Bay region. It was collected at Garvanza in 1904, at Redlands in 1905, at San Diego in 1914, and near Upland in 1917.

*Hypochoeris radicata* L. (hairy cat's-ear), another European introduction, abounds from Humboldt County to Monterey County and is also noted by Munz (1935) at Santa Barbara and Pasadena. Greene (1894) reports it as "common in shady, grassy ground at Berkeley, where it began to appear only a few years ago." According to Parish (1920), it was a roadside weed at Santa Barbara in 1907. Other early collections were at Dutch Flat in 1889, Pasadena in 1893, Mendocino in 1898, and Camp Grant in Humboldt County, 1899.

### LACTUCA

There are five introduced species of *Lactuca* within our borders: *Lactuca scariola* L. (prickly lettuce), a naturalized European weed; *L. canadensis* L. (tall lettuce), a native of the eastern United States; *L. ludoviciana* DC. (western lettuce), also an introduction from the East; *L. saligna* L. (willow lettuce), naturalized from Europe; and *L. virosa* L. (acrid lettuce), also naturalized from Europe. A variety of *L. scariola* in California, *integrata* Gren. & Godr. (prickly lettuce) occurs with the species.

There is no evidence that any of these species were introduced in California during the Mission Period, nor do Bolander (1870) and Brewer and Watson (1876) list any species of *Lactuca*; even as late as 1890 Hilgard (1890) makes no mention of the species in his *Weeds of California*. The earliest record is that of K. Brandegee (1891), who states that *Lactuca scariola* is "becoming established at Berkeley." Two years later T. S. Brandegee (1893) states that it "was becoming common about Lake and upper Napa counties, and about the Sacramento River." Variety *integrata* was collected at Pasadena in 1895; was established in a few places in San Bernardino in 1895, according to Parish (1909-10); and was reported in 1896 as troublesome in places at Compton. Parish

(1909–10) further states that two plants were collected at Los Angeles in 1896 by Davidson, who in 1907 called it “one of the most troublesome weeds in the Los Angeles district, even invading the black mustard.” Jepson (1893) cites *L. scariola* in the lower Sacramento Valley. According to Hall (1907), the typical *scariola* has apparently not yet arrived in southern California; earlier collections there reported as *L. scariola* are really the variety *integrata*.

The other species of *Lactuca* in California are undoubtedly much later introductions than *Lactuca scariola* or its variety *integrata*. *L. canadensis* is reported from only a few localities: Sisson, Fall River Lake in Shasta County, and Sierra Valley; *L. ludoviciana* only from Fall River Lake; *L. virosa* from the vicinity of Berkeley, where it is well established; but *L. saligna* from much of central California. Specimens of the latter have been taken in 1928 at Kelseyville, where it is a common field weed; at a point four miles west of Rio Vista Junction in Solano County; in Strawberry Canyon in the Berkeley Hills; and in the hills above Millbrae in San Mateo County.

#### LAPSANA

*Lapsana communis* L. (nipplewort) thus far has been found only at Arcata, Humboldt County. It is a European species.

#### LEONTODON

In August, 1936, the Old World species, *Leontodon autumnalis* (L.) Banks (fall dandelion), was collected near Carlotta, Humboldt County. *L. nudicaulis* (L.) Banks (rough hawkbit) is also from the Old World. The subspecies *L. nudicaulis taraxicoides* (Vill.) Schinz & Thell. was collected in 1889, at Mendocino; in 1909, in the immediate vicinity of Eureka; in 1933, around Humboldt Bay; and again, in 1936, near Carlotta; in 1889, at Dutch Flat in Placer County; and in 1934 on the lawn near Jordan Hall, Stanford University. This subspecies is also common on the University of California campus at Berkeley, where the subspecies *L. nudicaulis Rothii* (Ball) Schinz & Thell. also occurs. An early collection there was in 1907.

#### MADIA

*Madia sativa* Molina (Chilean tarweed), regarded as an introduction from Chile, has become naturalized throughout much of California.

#### MELAMPODIUM

*Melampodium perfoliatum* H.B.K., from Mexico, has thus far been found only in waste places about Los Angeles. According to Parish



(1890-91), who first reported it there as plentiful in damp grounds and along ditches, "the extent to which it has established itself indicates that it was an early introduction."

#### PICRIS

*Picris echioides* L. (bristly ox-tongue) is naturalized from Europe. Leeds (1891) says, "It is a conspicuous object on the main roads from Alviso to Santa Clara and San Jose, and spreads laterally some distance from these toward the east and west sides of the valley." It was collected at Huntington Beach, 1909; Santa Monica, 1913; Dominguez Junction, 1914; Mesmer, 1917; Santa Ana, 1919, where it was reported as a "recent introduction"; and San Bernardino, 1917, where Parish (1920) called it "a very recent introduction." Today it is common in fields, vacant lots, and waste places over the range covered by these localities and has also been collected at Cape Mendocino and Mt. Diablo.

#### RUDBECKIA

*Rudbeckia hirta* L. (black-eyed Susan) has been introduced from the eastern United States in the meadows of the Sierra Nevada from Mariposa County to Amador County, and also occasionally along irrigating ditches in Stanislaus County.

#### SCOLYMUS

*Scolymus hispanicus* L. (golden thistle), introduced from southern Europe, thus far has been found at one locality in this state, namely Los Gatos, where it was abundant as early as 1893 (Eastwood, 1896*d*).

#### SCORZONERA

By 1900, according to Eastwood (1900*b*), *Scorzonera hispanica* L. (black salsify) "has become naturalized around Calistoga and in Knight's Valley. It can be found along the roadside, growing where the ground is wet. This has undoubtedly escaped from cultivation, as it is sometimes cultivated for its roots, which are eaten as those of *tragopogon* or salsify." Today it is found in the upper Napa Valley, Knight's Valley, and Ukiah Valley. It is a native of central and southern Europe.

#### SENECIO

*Senecio Cineraria* DC. (dusty miller), native to the Mediterranean region, is locally common on the coastal bluffs at Santa Cruz. *S. elegans* L. (purple ragwort), a garden plant from South Africa, is adventive at San Francisco. Eastwood first collected it in October, 1912, at Lands End. In the same year she also found *S. Jacobaea* L. (tansy ragwort) at Fort Bragg, Mendocino County, where it is now abundant on the coastal flats. It is a European species. *S. sylvaticus* L. (wood groundsel),

naturalized from Europe, is distributed, says Jepson (1923-25) in the woods of Mendocino and Humboldt counties. According to Parish (1920) it was collected along the waterfront at San Diego in 1901, and near Riverside in 1909. A very common European weed throughout California is *S. vulgaris* L. (common groundsel); early collected at Los Angeles in 1892 and at San Diego, Santa Barbara, and Claremont in 1916. *S. mikanoides* Otto (German ivy), a naturalized species from South Africa, is found along the coast from Berkeley to San Luis Obispo.

#### SILYBUM

The earliest record in California of *Silybum Marianum* Gaertn. (milk thistle), an alien from the Mediterranean region, is that of Behr (1891), whose *Botanical Reminiscences* mentions seeing in 1854, between San Francisco and the Presidio, "luxuriant masses of the milk thistle" which had not been there a year earlier. K. Brandegee (1891) found it abundant in 1854 at Prairie City near the eastern line of Sacramento County. It was collected at Knight's Ferry in 1857, by Bolander (1870) about San Francisco, and by Brewer and Watson (1876) at "San Luis Obispo, on rocky hills, and probably elsewhere." Parish (1890-91) says: "Ten years ago I first noticed a half-dozen of these thistles by the Southern Pacific Railway in the San Mateo Canyon. Their introduction was doubtless due to the railroad. A few years later a single plant appeared near Kehls Mills, a mile or two south of San Bernardino." E. Johnson, in 1918, cites it, in correspondence, as a serious pest in pastures near Ontario. Today milk thistle is common throughout the agricultural sections of California.

#### SOLIVA

*Soliva sessilis* Ruis & Pavon, probably naturalized from Chile, has become established at scattered points along the coast. Brewer and Watson (1876) report it from Santa Barbara. Early collections were at Oakland Hills, 1879; Berkeley, 1883; San Diego, 1884; San Simeon, 1888; Arroya Grande, 1895; and Contra Costa County, 1898. Collections have also been made at Ione, Berkeley, Hupa in Mendocino County, San Francisco, San Luis Obispo, Humboldt Bay, Eureka, the foothills west of Saratoga, Howell Mountain, the Santa Cruz Mountains, and New York Ravine in El Dorado County. Ball (1936) reports it as an objectionable lawn weed in Santa Cruz and Sacramento counties.

#### SONCHUS

In California there are four species of sow thistles, all naturalized from Europe and all weedy. The two most abundant ones, and the most seri-

ous from the weed standpoint, are *Sonchus oleraceus* L. (common sow thistle) and *S. asper* (L.) Hill (prickly sow thistle). *S. tenerrimus* L. (slender sow thistle) and *S. arvensis* L. (perennial sow thistle) are relatively rare in California; the former occurs in west San Diego County, at Point Loma, in the Santa Barbara Islands, and south to Lower California; the latter in Orange County, near Wintersburg, where it was believed to have been introduced in celery seed about 1903.

*Sonchus asper* was probably the first sow thistle brought into California, for its seeds have been found in adobe bricks of certain old buildings with construction dates as follows: San Antonio de Padua, 1771; Jolon in California, Santo Domingo, 1775; San Jose de Guadalupe, 1797; Mission San Jose; San Francisco de Solano, Sonoma, 1824; and Rancho El Sansal, 1834, and Rancho La Natividad, 1837, both at Salinas. It is doubtful whether the other *Sonchus* species found their way into California until long after the Mission Period. Torrey (1856) reports that from 1838 to 1842 *S. asper* was observed from San Francisco and the lower Sacramento River. Brewer and Watson (1876) state that it occurs in "waste places, not only around towns but also far in the interior." According to them, *S. tenerrimus* occurs around San Diego, was collected there in 1836 by Nuttall, and was doubtless introduced from the south of Europe. As for *S. oleraceus*, no specimens had yet been seen. In their *Additions and Corrections to Volume 1* (1880), however, they list *S. oleraceus* at Santa Barbara and San Diego. Bolander (1870) records the occurrence of both *S. asper* and *S. oleraceus* from near San Francisco Bay. Hilgard (1890), who cites *S. oleraceus* as a minor California weed, does not mention *S. asper*. Leeds (1891), who observed *S. asper* and *S. oleraceus* in Santa Cruz, reports that both are very prevalent at Santa Clara and perhaps well established all over the state. Parish (1890-91) includes *S. asper*, *S. oleraceus*, and *S. tenerrimus* among the naturalized plants of the four southern counties. According to Jepson (1893), *S. asper* and *S. oleraceus* formed a part of the riparian flora of the lower Sacramento.

#### TAGETES

*Tagetes minuta* L., a native of South America, is reported by Munz (1935) as naturalized at Riverside, being collected there in 1921.

#### TANACETUM

*Tanacetum vulgare* L. (tansy) is a European species well established at Quincy, where it was collected in 1902 by Hall (1907) and in 1933 by Keck (1933). According to Hall (1907), it was common in waste places all through the "American Valley." It has also become naturalized in Humboldt County along the road between Fortuna and Fernbridge.

## TARAXACUM

We should surmise from the wide distribution of *Taraxacum vulgare* (Lam.) Schrank. (common dandelion) in California today that it was an early introduction. Yet Brewer and Watson (1876) state: "There are some indications of the dandelion as an introduced plant; but it is as yet very local." Rattan (1879a) reported it as common about Humboldt Bay in that year. Davidson (1893), discussing the immigrant plants in Los Angeles County, remarks of the dandelion, "Solitary plants may be frequently observed in the lawns, but show no disposition either to multiply or to extend their range." According to Parish (1920), it was "occasional along streets" at Pasadena in 1895 and he reports that year at San Bernardino "a few plants in a single lawn." Further, in 1918, the weed was "still infrequent" at Upland but at El Monte "abundant and injurious in pastures." In the southern counties, apparently, the dandelion was rare even as late as 1900. In the San Francisco Bay region, Hilgard (1890) does not list it, and Greene (1894) reports it as "accidentally introduced and scarcely naturalized." As late as 1898 it was apparently so rare near the Bay that Davy (1898c) records two exact places where it could be found in Oakland. Today the dandelion is a common weed in lawns throughout the state, and is not infrequently found in pasture land. It also occurs in meadows of range lands, where it is often regarded as an important forage plant, being eaten by all classes of livestock, especially sheep.

*Taraxacum laevigatum* (Willd.) DC. (red-seeded dandelion), an introduction from Europe, occurs in the San Francisco Bay region especially, according to Jepson (1923-1925), in old gardens and low places.

## TRAGOPOGON

Three introduced species of *Tragopogon* have been found in California. The most common of these is *T. porrifolius* L. (salsify). This is a native of the Mediterranean and was first reported here by Leeds (1891). He states that "Single specimens of purple salsify are to be seen at a number of points along roadsides, in this vicinity (Santa Clara), evidencing recent establishment." K. Brandegee (1891) calls it "now very freely naturalized in the northern part of the State." Parish (1920) reports it as frequent in streets and waste places at Santa Monica in 1916; and in 1903 collected it at Los Angeles. It is also recorded from Yreka, Fort Bidwell, Honey Lake Valley, Berkeley, and Ross Valley. *T. pratensis* L. (meadow salsify) was collected at Loyalton, Sierra County, in 1918; and *T. dubius* Scop. at Weed, Siskiyou County, in 1936. Both are natives of Europe.



## VERBESINA

*Verbesina encelioides* Gray var. *exauriculata* Rob. & Greenm. (crown-beard) has been introduced into California from the eastern United States. It is found from the San Fernando Valley to Riverside County and has been collected along the Salinas River, at Glendale, Cahuenga Pass, and Riverside. Parish (1920) collected it at El Monte in 1882 and near Colton in 1897.

## XANTHIUM

There are two introduced species of *Xanthium* in California: *Xanthium spinosum* L. (spiny clotbur), probably a native of South America, coming to us by way of Europe; and *X. canadense* Mill. (cocklebur), a native of eastern North America. Bolander (1870) cites both *X. spinosum* and *X. strumarium* (*canadense*) near San Francisco. Brewer and Watson (1876) report *X. spinosum* from "sea coast, San Juan, etc.; also in foot hills, Calaveras County," and *X. canadense*, "waste grounds near dwellings, etc.; also on the sea coast." Hilgard (1890) lists both species. Parish (1890-91), referring to southern California, says that "*X. canadense* is a common pest, especially of pastures and the borders of highways. *X. spinosum* is as yet fortunately rather rare, but is seen here and there by the roadside and is slowly increasing." Both species are listed by Jepson (1893) as part of the riparian vegetation of the lower Sacramento. Parish (1913) cites these species among those missing in the Imperial Valley flora. Today *X. spinosum* is spreading in the Great Valley and assuming major importance, and Jepson (1923-1925) states that it is "everywhere a common summer tenant of barnyards and neglected fields."

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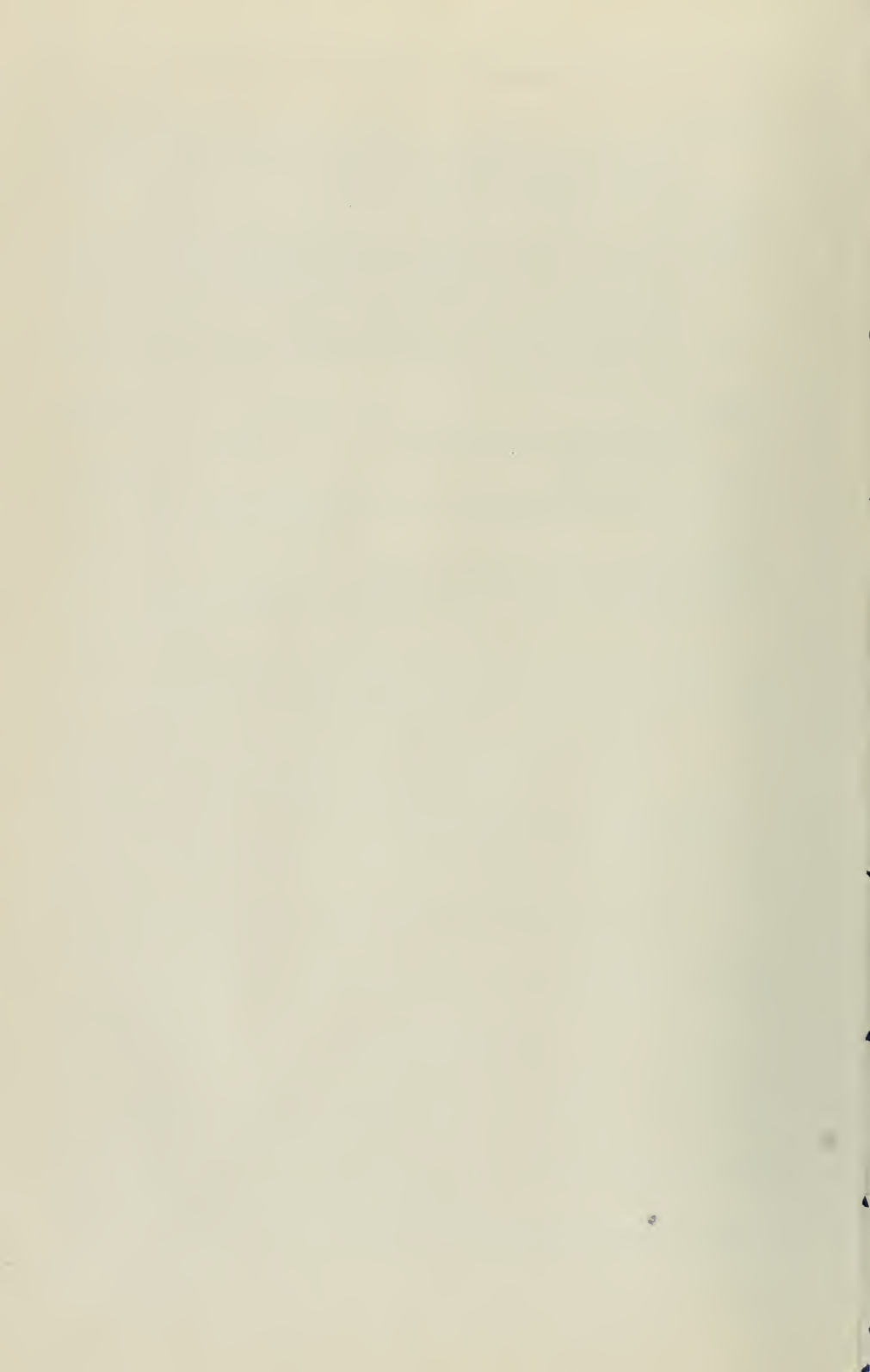
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